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NOVEMBER 30, 1961

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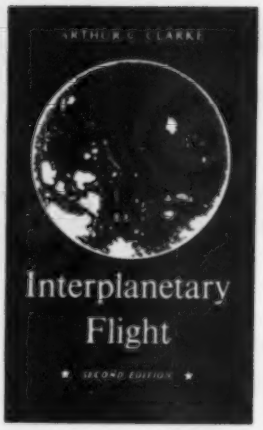

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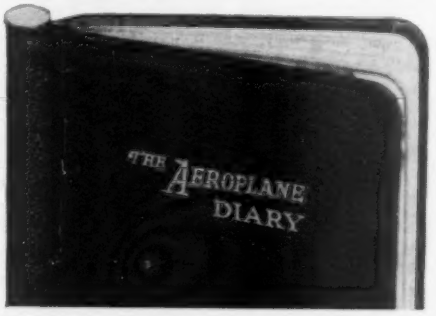

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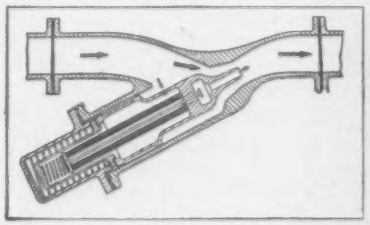

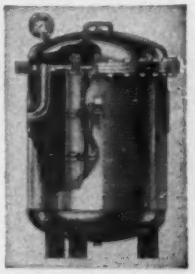

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VOLUME 101 NUMBER 2615 NOVEMBER 30, 1961

Civil Aviation and Government Policy

Last week the decision by Mr. Thorneycroft to stop Cunard Eagle from operating scheduled services across the North Atlantic carried sufficiently alarming implications to occupy most of the attention available for civil aviation. It was a pity that an already postponed air debate in the Lords should have taken place during this period because many important topics raised in the debate initiated by the Earl of Gosford on Nov. 22 did not receive the publicity they deserved.

Lord Gosford foresaw extensive re-equipment programmes thrust willy-nilly in the near future on the World's airlines consequent upon the introduction of large short-haul helicopters, VTOL aircraft and so forth, with attendant expense. Now on the top of this the country had to face the prospect of supersonic airliners, which would be a headache to manufacturers and airlines alike, while the cost would be enormous.

He understood that the British Aircraft Corporation design study for a Mach 2 aircraft was due to be handed over to the Ministry of Aviation about now, and that if taken up, a prototype might be flying by 1966 and airline service might start by 1970. But if America, and possibly Russia, concentrated upon a Mach 3 configuration, and were successful, would not our money spent on Mach 2 be wasted? Should we not also aim at Mach 3? Let the Government not be caught napping.

Following this opening, Lord Shackleton asked for "more order and less chaos at London Airport." Lord Stonham felt that there could be no effective British Civil Aviation industry unless based on British aeroplanes designed and manufactured here. Lords Waleran and Ogmore seemed doubtful of the value of the immensely costly supersonic airliners.

We doubt whether the British aircraft industry will extract much comfort from the generalities proffered in reply by Lord Mills, Minister without Portfolio. He gathered that Lord Ogmore and others would like Britain not to pursue the great and costly development of supersonic travel. That was not really possible. Profit margins were small in the civil aviation industry, and competition compelled expansion of capacity.

In addition to helping specific projects, the Government were maintaining a substantial programme of aeronautical research and were at the same time seeking what international co-operation there could be. "I hope," he declared, "that if and when we see the necessity of having supersonic aircraft in the air, we will be ready."

Such a reply concerning the timeliness of a national investment involving figures over one hundred million pounds is not likely to carry much conviction about precise planning. It is just such lack of planning that is causing so much concern to those at the head of our industry in their efforts to prevent the breaking-up of skilled design teams. Ambitious, talented people are not content to remain inactive, waiting for work to come their way.

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Matters of Moment

More Anglo-European Links

FOLLOWING recent reports of Anglo-French discussions on the subject of collaboration in a joint supersonic transport project (THE AEROPLANE AND ASTRONAUTICS, Nov. 23), the British Aircraft Corporation has announced an agreement with four European aircraft companies—Sud Aviation, Marcel Dassault, Finmeccanica and Dornier-Werke—to collaborate on "joint projects." The projects concerned range from supersonic airliners to V/STOL aircraft.

No further light is cast by the announcement, however, on the subject of the supersonic transport situation. After saying that B.A.C. and Sud Aviation are currently making collaborative arrangements which cover both existing and long-term aircraft projects and that the French company is making "important sub-assemblies" for the VC10, the statement adds: "Among the long-term projects being examined is possible collaboration in the field of a supersonic transport."

In the meantime, news from France is that the Council of Ministers is expected to give formal ratification to the decision taken last week by the French Inter-Ministry Committee on aviation in favour of official support for the development of a Mach 2.2-2.5 airliner. Under this decision, Sud Aviation and Dassault should receive 120-140 million NF in 1962 for Super Caravelle development studies.

According to French sources, the most favoured project is very similar to the Super Caravelle shown at the Paris Salon earlier this year. The same sources disclose that it will be powered by a new version of the Olympus—the Olympus 593, derived from the BOl 22R jointly by SNECMA and Bristol Siddeley—having a thrust of 28,700 lb. and a specific fuel consumption of .835 lb./lb./hr. The powerplants will have a variable-area air intake system.

B.A.C.'s collaboration with Marcel Dassault is related to the VTOL version of the Mirage—the Mirage 3V. This aircraft is to be powered by Rolls-Royce lift/thrust engines and B.A.C. and Dassault say that their joint proposal for it "is a practical step towards two important needs, the standardization of NATO equipment and co-operation between major European aircraft companies. . . ." Under this preliminary agreement, design and development work on the new aircraft will be done by the English Electric Aviation aircraft division at Walton and the agreement also envisages a joint sales programme and licensing arrangement.

In the case of the Italian and German companies, B.A.C. is making a joint submission with them for a tactical STOL transport to meet NATO requirements. The Bristol design team has already been collaborating with its Dornier-Werke and Finmeccanica counterparts, and it has been agreed that should the contract be awarded to this particular group, work on the aircraft would be divided equally among the three companies concerned.

Skyvan Progress

EVER since Short Bros. and Harland first announced their design for a light utilitarian freight aircraft—the Skyvan—and followed this news by showing part of its fuselage structure at Farnborough last year—there has been considerable interest in the project. This was increased at this year's S.B.A.C. Show by the announcement of a turboprop version with two 550-e.h.p. Turboméca Astazou engines as alternatives to the original Continental piston engines.

Last week the company disclosed that work on the Skyvan project had been intensified with a gradual build-up of the technical team engaged on it. Work on the prototype has, it appears, now reached the stage where construction of the wings and fuselage is nearly complete and the Continental engines are scheduled for installation within the next few weeks. Most of the proprietary components and instruments have been delivered, say the company, and the aircraft is expected to fly in the spring of next year.

A simple structure and rapid and easy assembly are prime requisites for an aircraft that is intended for the basic "work-horse" duties required of a light freighter of this type. In this, the Skyvan would appear to excel.

A feature of the airframe design is that its fuselage, wings and tail unit are assembled together by simple bolt joints, thus making not only for ease of initial assembly, but greatly facilitating repair, maintenance and overhaul in service. Four bolts attach the wing to the fuselage; the wing lift struts are attached by one bolt at each end; and the tail unit is held on to the fuselage by a four-bolt joint.

Weight and performance data given for the Skyvan are as follows, with the turboprop Skyvan 2 figures given in parentheses:—

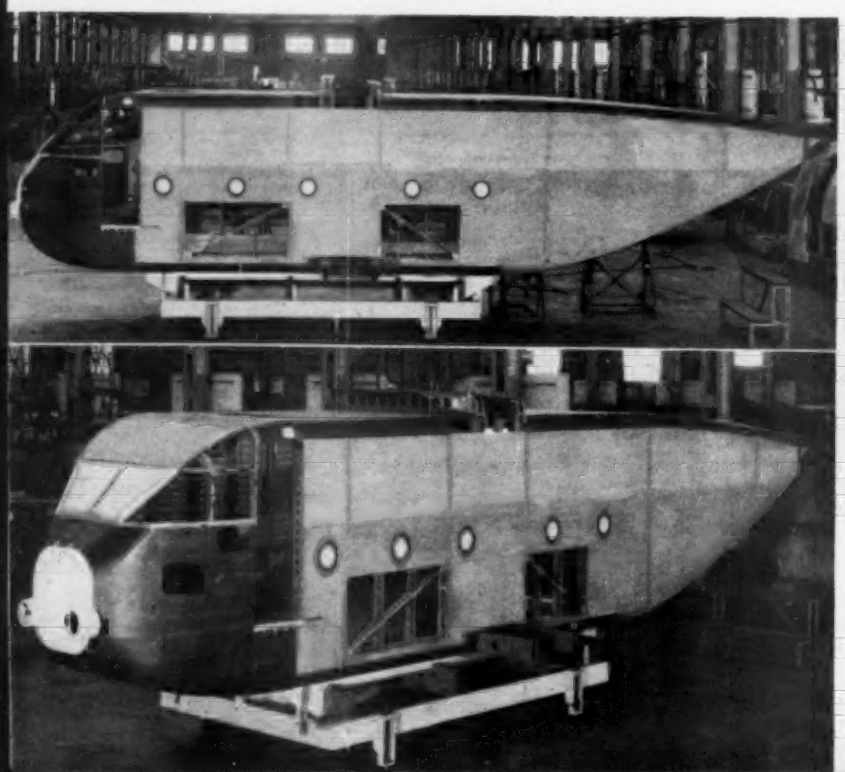
Design Data

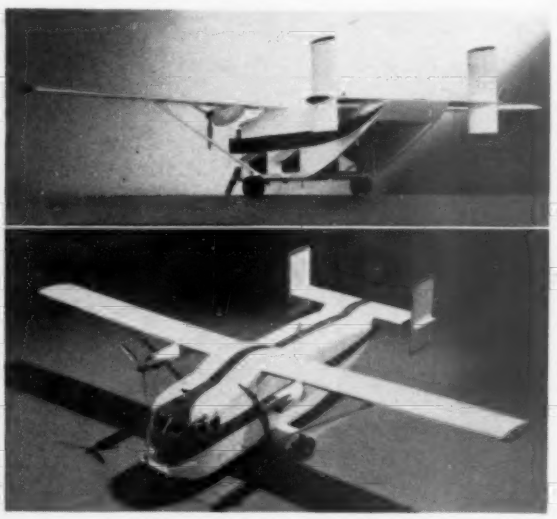
Weights.—Aircraft prepared for service, 6,030 (6,190) lb.; max. payload, 3,000 (4,500) lb.; max. fuel, 1,080 (1,400) lb.; all-up, 9,500 (11,500) lb.

Performance.—Take-off ground run, 490 (565) ft.; distance to 50 ft., 1,365 (1,365) ft.; max. continuous cruise, 196 (205) m.p.h.; max. economical cruise, 160 (160) m.p.h.; max. range cruise, 126 m.p.h.; max. equivalent still-air range, max. payload, 408 (425) miles; max. equivalent still-air range, max. fuel, 960 (720) miles.

Progress With the BS.75

BRISTOL SIDDELEY'S first BS.75 turbofan engine will be installed and running at the company's test-beds at Patchway next January. A second engine will be completed in February; engines for flight installation will be available early in 1963; and certification will be completed in 1964.





UTILITARIAN TRANSPORT.—As recorded on this page, the fuselage of the prototype Short Skyvan is now in an advanced stage of construction at Belfast. A particular feature of the Skyvan is its capacious and easily accessible freight hold.

TWO OF A KIND.—First photograph of both the Hawker P.1127 prototypes at Dunsfold, where development flying in the vertical and horizontal regimes is proceeding apace.

Giving this news last week, the company said that the test-bed running of the engine in January will mark the culmination of more than two years of design work and a year of successful rig testing on all major components and many minor assemblies. It is "confidently expected" that the BS.75 will achieve an overhaul life of 2,000 hr. within 250,000 flight hours.

This new powerplant has been designed to meet the requirements of the coming generation of short/medium-range civil turbojet transports. For these aircraft a low fuel consumption and a low noise level are of paramount importance and in this direction the characteristics of the high by-pass ratio turbofan engine show to particular advantage. The BS.75 is a front-fan two-shaft engine with a by-pass ratio of 1.75 : 1 and a specific consumption of 0.508 lb./lb./hr.

Although, say Bristol Siddeley, it is an entirely new design, it is closely related mechanically to earlier engines produced by the company. Significantly, in recording its first applications—BAC.107 and Avro 771—the company goes on to say that the new engine is also under consideration for military projects as well as for other civil ones.

Executive Operators Progress

IN its first half-yearly progress report, the Business Aircraft Users' Association gives some encouraging news of developments in British executive flying, including a 50% increase in membership. Twenty-six more companies from a wide range of industries have joined B.A.U.A.; its total membership is now 62.

The Association is represented on the M.o.A. Parliamentary Secretary's Standing Joint Committee, and on GAPAN's joint meeting to discuss the use of air space. Application for membership has been accepted by the Civil Aircraft Control Advisory Committee. The Flying and Legislation Committee of B.A.U.A. has been discussing Croydon as a future business airfield for London with the Controller of Ground Services, with the result that final approval of the Surrey County Council plans for the development of the airport site has been withheld. At the moment, the future of the site rests with the M.o.A. and the Minister of Housing.

Permission is also being sought to use Hendon, for northern traffic, and the use of Northolt is additionally being considered. The pressing need for aerodrome facilities at all major towns and cities is gradually being met; Chesterfield is going ahead with its plans for a new city airport which will also serve Sheffield; Sunderland Council has purchased Usworth from the Air Ministry and are opening it early next year; Carlisle has opened up Crosby as its civil airport, and Hereford City Council is considering purchasing the disused R.A.F. airfield at Shobden.

More flexible use of joint-user R.A.F. stations out of normal hours has been requested, together with the use of some disused airfields at short notice. To assist in such developments, B.A.U.A. is taking out a Contingent Liability Policy to cover all members against the Air Ministry indemnity for £250,000. At the same time, it is trying to negotiate standard credit arrangements for members at all R.A.F. stations, and the provision of a civil VHF frequency at all joint-user airfields to facilitate their use by business aircraft.

Other problems under negotiation include the provision of better Customs facilities, to reduce inward and outward clearing times, and non-technical handling facilities through B.E.A. for all full members at all airports in Europe and the Middle East. A meeting is being sought with the Meteorological Office to discuss the whole system of forecasts as applied to business aviation, including lower level information.

VTOL by Fokker/Republic

THE D.24 Alliance VTOL supersonic fighter-bomber project, being developed by the Fokker/Republic team, has sprung from a Republic study (RAC 758-1A) made some years ago. The NACA theory on variable-geometry wings, published in 1954-55, was made use of; and it has also been reported that the TFX project by Republic/Ling-Temco/Vought is to the same formula.

Power for the Alliance will be provided by a Bristol Siddeley BS.100 lift/thrust turbojet. The announced thrust is around 36,000 lb. and, therefore, the weight of the Alliance may be estimated between 32,000 and 33,000 lb.

In its high-speed configuration, the D.24 will have a narrow delta wing, with a leading-edge sweep of about 65°. The leading-edges will be sufficiently thick to house, on their upper surface, auxiliary wings which are hinged at their junction with the fuselage so that they can be spread for conventional take-off and landing. They will be hydraulically actuated. When deployed, they will form a near-straight wing with its own aileron system.

Thus, in the low-speed configuration, the D.24 will have a conventional control system, the delta-wing elevons, hinged on its fixed trailing-edge, acting as elevators. For vertical take-off and landing, the aircraft will use a full jet stabilization system, all stability problems being automatically resolved by an electronic computer.

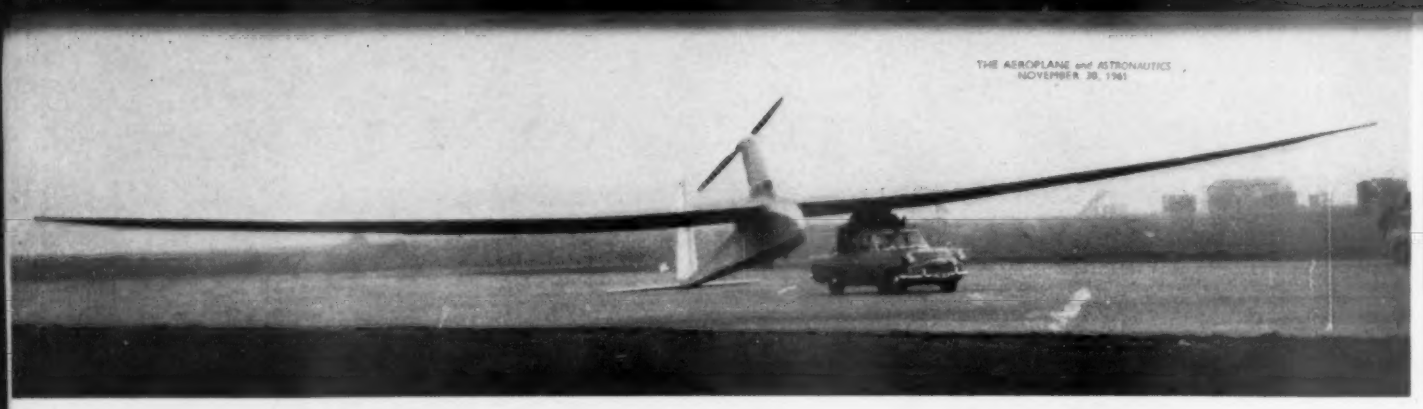
The Alliance is primarily intended as a reconnaissance and low-level strike aircraft but it can also be used as an interceptor. Its speed will be around Mach 2.2. A bomb-bay will be included in the fuselage and in this a part of the offensive stores and reconnaissance equipment will be housed.

The reconnaissance weapon system will be evolved from that developed for the F-105 Thunderchief multi-mission all-weather fighter. It will include three functions: infra-red detection, SLAR and photography. An immediate processing system will furnish printed photographs to the pilot in a matter of seconds.

A part of the offensive load will be suspended directly under the fuselage. The armament includes the Nord AS-30 air-to-ground guided missile, but other missiles can be accommodated.

The D.24 project will be submitted to the NATO competition for a VTOL fighter-bomber to the BMR-3 specification. At the same time the Fokker/Republic team will inaugurate a vast industrial co-operation programme including at least five countries of continental Europe. In France, Breguet could be interested and the recent co-operation established between Fokker and Breguet for Friendship production will be remembered. If this consortium is to go ahead, the members will not submit their own design for the BMR-3.

The major interest of the Alliance VTOL fighter will be its great mobility and flexibility. Conventional take-off will be possible with a very heavy load but after a comparatively short run. Its mobility has been studied in relation to using very small surfaces such as lorries, barges or railway trucks.—R. DE N.



Realities of Manpowered Flight

ALREADY enough flying has been done in England by two different manpowered aircraft to have established the practicability of manpowered flight. Direct competition between two teams, as in the University Boat Race, could be arranged at any time. The Royal Aero Club has obviously to get busy and persuade the Fédération Aéronautique Internationale to make provision for manpowered records. How soon before the Russians and Americans are breathing down our backs?

Mr. Kremer, who has so generously offered £5,000 to the first team to get a manpowered aircraft round a figure-of-eight course with turning pylons half a mile apart, has every reason to be pleased with the progress so far made. How it would have delighted the late Mr. H. B. Irving, first chairman of the Manpowered Aircraft Committee.

During the trials now being made at Hatfield and Lasham in Hampshire it has been established that manpowered flight can be achieved with a certain regularity and what is much more astonishing the enormously high aspect ratio aircraft with their spans of 80 ft. can be pedalled into the air rather more easily than had been expected.

The Hatfield Group under Mr. Wimpenny have issued a formal communiqué recording that achievements of flights of a quarter of a mile at heights up to 6 ft. have been regularly obtained. The statement also refers to towed flights for the purpose of comparing the actual drag with that calculated.

At Lasham flights are being made along the main runway with sufficient regularity that they have to be worked in so as not to interfere with the regular winch-launchings of the instructional machines.

Arriving early on Saturday morning last with Mr. B. S. Shenstone, whose paper on the subject as far back as 1956 triggered off the formation of the Manpowered Aircraft Committee, one found the Southampton Group's machine carefully pushed up against the wall of the new hangar which the gliding enthusiasts are putting up with their own money after the ha'penny-snatching Air Ministry had pulled down their own hangar and caused it to be transported away rather than it should be taken over by the only people who can do anything to create air-mindedness, the lack of which is such a worry to the Air Council.

The hangar, of course, can be erected only slowly. The fragile structure of the S.G. aircraft is being housed under a roof and against a wall; the wind blows through the open ends at speed. When one considers the dimensions of the machine with its span of 80 ft., the large side areas of fin carrying the airscrew and the oversize rudder needed to provide adequate turning moment, and contemplates the fragility of the structure which weighs around 120 lb., the dangers of such a domicile are indeed frightening.

November 25 was a lovely day and in the early morning the English countryside was at its autumn loveliest. The wind seemed fresh and indeed its strength had seemed to militate against the likelihood of any flights being made. However though plenty of people are ready to liken the present stage of manpowered flight with that existing at the time of the Wright brothers' experiments, the Southampton Group have no hesitation in taking their machine out and launching with the wind blowing at 8 knots, as it was on Saturday.

Use has to be made of the main runway even though it is out of wind. However it has been found that its superior surface more than offsets the disadvantages.

Around nine-thirty the machine was in position at the start of the runway and Mr. Derek Piggott was in his plywood-backed seat. His head fitted into the transparent base of the pylon carrying the airscrew. When the last adjustments have been made the closely fitting nosepiece is taped into place. Between Mr. Piggott's legs are the pedals and sprocket-wheel driving the conventional chain to the bicycle wheel behind him. Beneath his feet is a nosewheel with limited castoring travel.

From the bicycle wheel an endless steel band drives the 8-ft. propeller. This is a beautifully finished job, built up around an alloy tube with light alloy riblets and balsa packing blocks. The whole is covered with tissue and then lacquered. The finish is so good that no outward signs of the built-up construction are visible.

Tunnel and other tests have established a phenomenally high efficiency for the airscrew and drive. It is certainly strange to see a machine flying with such a slowly revolving airscrew.

The Hatfield team also decided that a wheel drive was essential for acceleration up to take-off speed but their installation has been described as a mechanical marvel. The pilot and pedaller is inclined forwards as seen in (4) below.

The bicycle wheel, beneath him, is driven through gearing and in turn transmits power to the propeller through a large diameter balsa-wood shaft (see 3). When one considers that the all-up weight for the Hatfield craft is said to be around 110 lb. it can be seen how meticulous has been the weight control exercised.

Another difference between the machines has been the use of a tailwheel by the Hatfield team, necessitated by the propeller at the tail. This is interesting because on several of the flights of the Southampton machine the tail dropped and the tail-skid dragged on the hard runway with a noticeably retarding effect. The Hatfield machine may have a worth-while advantage here.

The question of control is, of course, the major problem and the lack of reference for the pilot makes things more difficult. At present "cross-wires" of tape on the windscreen are the only guide and are used by lining up on the horizon. They are so close to the pilot's eyes that their value seems limited.

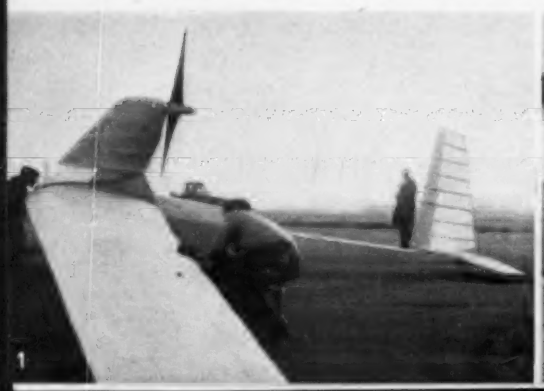
Control in the Southampton machine is by horizontal bar inside the wing-leading edge. It is worked like an old-fashioned rudder bar for moving the rudder. It is pushed from side to side for moving the ailerons and pulled back or pushed forward for moving the elevator.

The early trials were largely concerned with modifying the controls and their gearing to make them acceptable to Mr. Piggott. He admits that in the early stages his greatest anxiety was the possibility of wrecking the machine.

Slowly, control of the machine was improved. Pictures exist of one ground-loop when the outer 15 ft. of one wing were on the ground. Nothing broke.

At last all was ready and we moved down the runway with ciné-camera at readiness. Slowly the machine was pedalled up to the rise of the runway and then it began to accelerate towards us. At what seemed a slow speed, but when the runner at the wing-tip had been outpaced, it lifted smoothly into the air until it was six feet or more above the ground. At one time the nose went up dangerously high but it was brought down again. The machine finally came to rest on the grass well downwind of

4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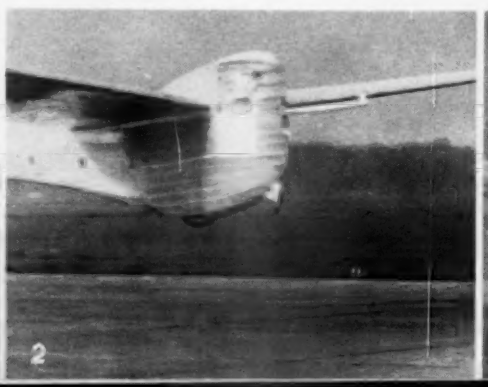
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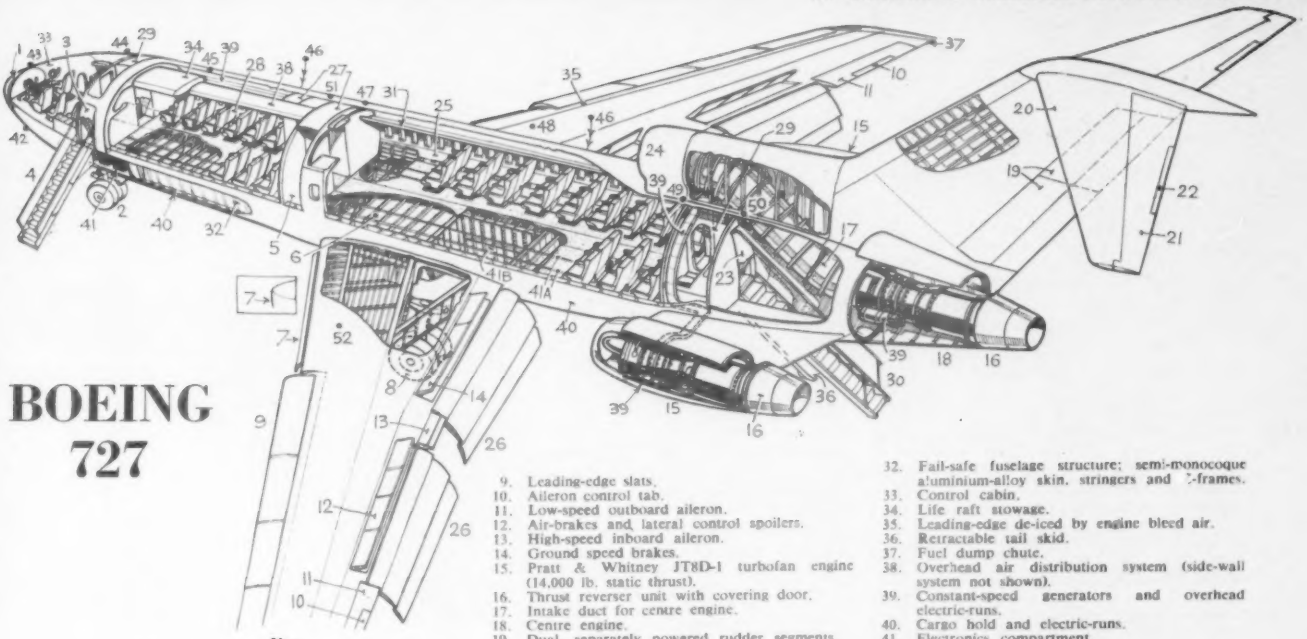
BOEING 727



Key

1. Weather radar scanner.
2. Forward-retracting nose wheel gear; dual wheels with brakes.
3. Front outward-opening plug-type passenger entry door.
4. Integral passenger stairs (telescopic, under floor).
5. Coats.
6. Wing centre-section containing bag-type fuel cells.
7. Krueger flap.
8. Main landing gear; dual wheels, inward retracting.
9. Leading-edge slats.
10. Aileron control tab.
11. Low-speed outboard aileron.
12. Air-brakes and lateral control spoilers.
13. High-speed inboard aileron.
14. Ground speed brakes.
15. Pratt & Whitney JT8D-1 turbofan engine (14,000 lb. static thrust).
16. Thrust reverser unit with covering door.
17. Intake duct for centre engine.
18. Centre engine.
19. Dual, separately powered rudder segments.
20. Movable horizontal stabilizer.
21. Elevator.
22. Elevator control tab.
23. Rear plug-type passenger entry door (inward opening).
24. Centre engine air inlet.
25. Tourist section (six-abreast seating).
26. Triple-slotted high-lift trailing-edge flaps.
27. Double unit mid-cabin galley.
28. First-class section (four-abreast seating).
29. Toilets (one forward; two aft).
30. Aft integral passenger stairs.
31. Windows; three-pane acrylic plastic at 20-in. spacing.
32. Fail-safe fuselage structure; semi-monocoque aluminium-alloy skin, stringers and Z-frames.
33. Control cabin.
34. Life raft stowage.
35. Leading-edge de-iced by engine bleed air.
36. Retractable tail skid.
37. Fuel dump chute.
38. Overhead air distribution system (side-wall system not shown).
39. Constant-speed generators and overhead electric-runs.
40. Cargo hold and electric-runs.
41. Electronics compartment.
41a. Twin seat-rails.
41b. Wheel well.

Service-vehicle Stations Around Aircraft

42. Tow.
43. Electric power.
44. Toilet service.
45. Drinking water.
46. Baggage loading (underneath).
47. External air conditioning.
48. Optional fuel point.
49. Toilet service.
50. Pneumatic engine starter.
51. Galley supply.
52. Fuelling point.

the runway and not far from the group of training gliders waiting to be winched off.

Four more flights followed. They were all successfully controlled and in each Derek Piggott got the machine into the wind and on several landed on the upwind side of the runway. This sequence of events demonstrated clearly that pedalling the machine off the ground is not an absolutely exhausting process, or Mr. Piggott, who is 39, might find the going too hard.

He disclosed that on the previous evening once off the ground he had felt so much in command of the situation that he had been able to relax, pedal more slowly and get his second wind.

In the last flight witnessed on Saturday the total effort lasted for 30 seconds, though our observations indicated that the longest the tailskid was off the ground was 17 seconds.

Both teams obviously have a long way to go. Techniques to achieve tighter turns have to be established. At 28 ft./sec. it is going to take over 150 seconds to cover one mile in a straight line, so anything which can reduce the time spent on making a turn will be worth doing.

From this report it should be clear that the designers of the S.G. machine, Anne Marsden, David Williams and Alan Lassière, have achieved a certain niche in aeronautical history as indeed have Mr. J. C. Wimpenny and his helpers at Hatfield.—T.J.

Features of the 727

LATEST information from Boeing on the subject of the 727 short/medium-range transport has included some details of its internal features. (See cut-away drawing, above.)

Powered by three rear-mounted Pratt & Whitney JT8D-1 turbofan engines, the Boeing 727 embodies a number of innovations. For example, the powerplant thrust reversers are of a different type to those used previously. Doors which form part of the engine cowling cover the reversers in normal flight and during the reversing operation—when inner clamshell doors close behind the engine to deflect the efflux forward—a mechanical linkage opens these outer, cowling, doors which then serve as additional exhaust deflectors. The centre-engine reversers are at the side of the powerplant bay, while the reversers for the pod-mounted fuselage engines are arranged to deflect the exhaust above and below the engine.

Fully power-boosted controls have been chosen. Following normal practice, for lateral control at high speeds, inboard ailerons only are used; while at low speeds these are supplemented by outboard ailerons. There are spoilers on the outboard part of the wing which are used primarily for descent speed control, but are also used differentially to give additional lateral control. Another set of spoilers inboard is used after touch-down for shortening the ground run.

To facilitate the quick turn-rounds that are necessary for the sort of "bus stop" operation for which the aircraft has been designed, integral passenger stairs are provided. The primary access is at the rear of the cabin where the airstairs and door are located under the rear fuselage. Telescopic airstairs to the front cabin door can be provided if required.

The European Routes Decisions

THREE British independent airlines—B.U.A., Cunard Eagle and Starways—share 22 licences to operate scheduled services on domestic and European routes awarded by the A.T.L.B. B.E.A. receives licences for two new routes and Tradair would have been awarded four licences had it not been for the financial difficulties which now confront the company. Applications from Silver City and East Anglian were refused.

The A.T.L.B. accepted estimates that the independent companies will carry over 665,000 passengers on the new routes, in the three years from April, 1963, to March, 1966. In the same period on the same routes, B.E.A.'s anticipated traffic growth is over 2,217,000 passengers.

At the time of going to press, B.E.A. had made no comment on the decisions, B.U.A. have given them a guarded welcome, but comment that the number of routes awarded leaves no margin for economical operation. Cunard Eagle welcomes the decisions, but looks forward to the day when the independents obtain a greater share of the total traffic and comments that the licences granted provide sufficient work for two to three short-haul aircraft only.

British United Airways. All licences are for Viscount or BAC One-Eleven, and are effective from March, April or May, 1963, and expire in 1969 or 1970. All services are from and to Gatwick. IATA fares must be charged. Paris, twice a day; Amsterdam, daily; Zurich, three a week; Basle, twice a week (summer only); Tarbes, twice a week (summer only); Genoa, once a day; Milan, three a week (summer only); Athens, once a week (summer only); Barcelona, twice a week (summer only); Palma, four a week (summer only); Malaga, once/twice a week; Lisbon/Madeira, twice a week (summer), one a week (winter).

Cunard Eagle Airways. All licences allow the use of Viscount, DC-6C, Britannia, Vanguard, D.H.121 or VC11, and are effective from March or April, 1963, until 1969 or 1970. All services are from or to Gatwick or Heathrow, unless shown otherwise. IATA (international) or B.E.A. (domestic) fares must be charged. Geneva, three a week; Copenhagen/Stockholm, one/three a week; Venice, twice a week (summer only); Dublin, three/four a week; Belfast, seven a week; Edinburgh, five/seven a week; Glasgow, one a day; Manchester/Birmingham-Nice, one/four a week; Liverpool-Dublin, two/four a week.

Starways. Allows the use of DC-3, DC-4 or Viscount, from June 1, 1963, to Sept. 15, 1969. Chester-Isle of Man, two a week (summer only).

B.E.A. Allows the use of Viscount, Comet 4B, Vanguard and Trident. From April 1, 1963, to Mar. 31, 1970. London (Heathrow or Gatwick)-Malaga, daily; London (Heathrow or Gatwick)-Marseilles, frequency unrestricted.

Aviation News in General

A.T.C. CENSUS.—During next week, Dec. 4-10, the Ministry of Aviation will make the first census of air traffic over the U.K. and associated areas. The programme for and purposes of the census were detailed in our issue of Oct. 19, p. 510. The object is to provide basic information for the planning of future air traffic control and the census will be repeated every six months.

AUSTRALIAN ORDER?—The Dassault Mirage IV is reported to be favoured by the R.A.A.F. in its present evaluation of a tactical bomber to replace the Canberra. Other types considered are the North American A3J Vigilante, Convair B-58 and B.A.C. TSR-2. The requirement is for 15-20 aircraft.

VC10 RADAR ORDER.—Ekco duplicate Type E190 weather radar has been ordered by B.O.A.C. for its VC10s. Ekco now holds more than £500,000 worth of orders for this equipment which has also been specified for Transport Command's 10 Belfast freighters.

TURBOMECA AUBISQUE. — First details have been given by Turboméca of their small turbofan named the T-61 Aubisque. With a maximum thrust of 1,550 lb. and a dry weight of 397 lb., the Aubisque has been specified for the Saab 105 and Hispano HA-230 business and general purpose twin-jet aircraft.

VTOL FAN FUNDS.—General Electric has been awarded a $6.9 million contract by the U.S. Army Transportation Research Command as initial funding of two VTOL test-bed aircraft using the G.E. J85-5 fan-lift engine. Ryan will build the airframes under sub-contract.

SKYBOLT VULCAN.—Reports that a Vulcan B.2 has been seen with a dummy Skybolt ALBM underwing are confirmed by this photograph taken shortly after the aircraft had taken off from Avro's Woodford airfield. The pylon mounting under the starboard wing for a second Skybolt is clearly visible.

F-86 Sabres may be acquired in the near future but our Mexican correspondent tells us that because the Vampire has proved so satisfactory there is talk of buying more British jets of later design provided they can operate from relatively undeveloped airfields. Gnats and Hunters have been mentioned in this connection.

AZCARATE WITHDRAWS.—Gen. Juan F. Azcárate has withdrawn from the Lockheed-Azcárate company formed to produce the LASA-60 utility aircraft at San Louis Potosí in Mexico. Fifteen aircraft have been built but none has been sold. The factory is now to undertake sub-contract work on U.S. missiles.

Additional Editorial Staff Required

AN expansion of the editorial coverage of this journal, now being planned, has created two additional vacancies for writers on our staff. Both posts offer considerable prospects to men aged 23-30 with a good news sense and able to write crisply on aviation.

One opportunity is for a man with knowledge and experience of aeronautical engineering, especially of powerplants.

The second vacancy, of equal importance, is for a man with knowledge of the air transport side of aviation who should have had practical airline experience.

Full details should be sent in writing to: H. M. Hughes, Editorial Manager, Temple Press Limited, Bowling Green Lane, London, E.C.1. Phone inquiries to Terminus 3636, extension 56.

U.S. HELICOPTER NEWS—Names have been allotted to four types by the U.S. Navy and Marine Corps. These are: Boeing Vertol HRB-1 Sea Knight (14 are on order for the Marines), Sikorsky HUS-1 Seahorse, Sikorsky HSS-1 Seabat and Sikorsky HSS-2 Seadragon. The prototype of the Army's HC-1B Chinook has achieved 150 m.p.h. at a gross weight above its normal maximum (33,000 lb.) and has since flown for long periods at this speed.

MORE JETS FOR MEXICO.—The only jets operated by the Mexican Air Force, 15 ex-R.C.A.F. Vampire Mk. 3s, have been joined by 15 Lockheed T-33s and a second squadron has been formed; £2 million is to be spent on modernizing the base at Santa Lucia for jet operations. According to reports

MIRAGE NAVIGATION.—As well as Sperry twin-gyro platforms the Computing Devices of Canada position and homing indicator has been selected to form part of the navigation equipment for the R.A.A.F.'s 30 Mirage IIIs.

FLYING FARMERS NOTE.—The agricultural aviation group of the R.Ae.S. is to hold its first all-day meeting on Dec. 13 when the subject will be "Uses of the Aeroplane in Agriculture." Four papers are to be read, namely, "The Operator's Year," "Aerial Treatments in Forest Areas," "Chemical Cultivation and Re-seeding from the Air" and "Agricultural Aircraft for the Future." Each will be followed by a discussion period. The meeting will be held at 4 Hamilton Place, London, W.1, from 10.00 to 17.30 hrs.

WESSEX BUILD-UP.—The second F.A.A. Wessex squadron—No. 814—was due to be commissioned at R.N.A.S. Culdrose on Nov. 28. Commanded by Lieut. Cdr. L. J. B. Reynolds, R.N., the squadron is expected to embark in the carrier "Hermes" during the first half of next year.

NEW BEECH.—First flight of the new Beech Model 23 Musketeer $12,000 single-engined lightplane took place in October. Beech is also developing a turboprop executive aeroplane.

VARIABLE SWEEP TESTS.—More than 2,500 hours of wind-tunnel work have already been spent by Boeing on a variable sweepback programme involving subsonic, transonic and supersonic regimes. The work is intended primarily for military applications and is backed up by a complementary structural test programme.

FRENCH BUDGET.—Of the NF 100 million allocated for Caravelle development in the 1962 appropriation of the French Department of Public Works and Transport (see our issue for Nov. 2), NF 40 million is intended for modernization of the Caravelle I and III, and the remainder for development of the Caravelle 10A and 10B.

BIOS SHOT.—Following the failure of the first Argo D-8/Bios launching at Port Arguello on Nov. 15 (p. 680 last week), a second firing on Nov. 18 resulted in the 86-lb. re-entry body falling 500 to 600 miles from the intended recovery area in the Pacific. The package containing bacteria and other biological specimens was lost.

FRENCH ROCKETRY.—Two 3-ton Agatha rockets were successfully launched from the Hammaguir range in the Sahara on Nov. 13 and 17. Instrumented nose-cones were recovered from heights of some 40 miles. Tests are related to a research programme to develop an all-French satellite launcher by 1963-64.

SPACE PRIMER.—A 64-page Space Diary, including data on rockets, artificial satellites, space probes, tracking, man-in-space, astronomy and facts and figures on careers and international organizations, is available from the Interplanetary Publishing Co., 12 Bessborough Gardens, London, S.W.1. It costs 5s. 6d. post free; 6s. 6d. ($1.00) abroad.

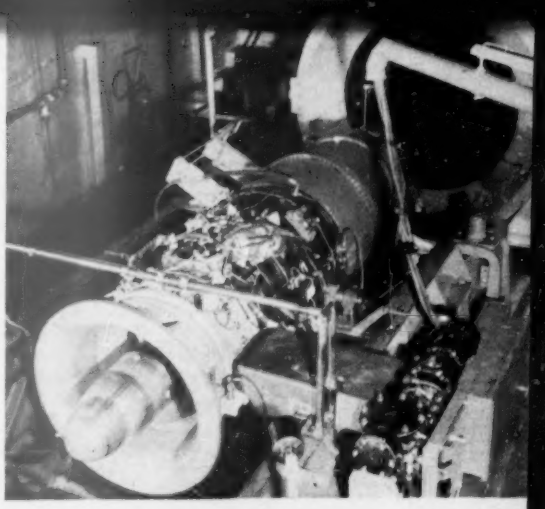
SECRETIVE.—For the first time, on Nov. 22, a satellite launching was carried out in the United States without prior notice being given to the Press. It was believed to have concerned the launching from Point Arguello, Calif., of an Atlas-Agena B carrying a Samos reconnaissance satellite of the type being developed to televise pictures back to Earth and eject capsules containing exposed photographic film.

ANOTHER ANTI.—A Nike-Zeus anti-missile missile was "successfully tested in long-range flight" for the second time in five days, on Nov. 21. All test objectives were met, the missile carrying ballast in the third stage instead of the nuclear warhead. The U.S. Army is said to be anxious to test nuclear warhead for Zeus should the U.S. resume nuclear testing in the atmosphere.

SKYLARK SUCCESS. — The programme of upper air research carried out with four Skylark rockets equipped with instruments designed and built in the United States has been successfully completed. The launchings from Woomera were made to measure ultra-violet radiation from the stars in the southern hemisphere, under agreement with NASA.

APOLLO COSTS. — Development of the three-man Apollo spacecraft for lunar exploration is expected to cost between $300 million and $500 million over the next five years, according to NASA estimates. By comparison, the total cost of the Mercury programme, to end when several astronauts have made orbital flights, will probably be about $400 million.

ASTRONAUT PROPULSION. — A personal propulsion pack for weightless astronauts has been demonstrated by Bell Aerosystems Co. Strapped around the waist, the pack consists of a number of curved metal tubes containing nitrogen gas under high pressure and a gas-jet control system. Handles at the side enable the wearer to exhaust controlled amounts of gas which move him forwards, sideways and up and down.



EXECUTIVE POWER.—Chosen to power both the D.H.-125 and Piaggio-Douglas PD-808 jet executives, Bristol Siddeley's Viper 20 turbojet is now being run on the test bed at Patchway. The Viper 20 is a development of the Viper 11 with an additional compressor stage resulting in a thrust of 3,000 lb. and an improvement in specific fuel consumption.

Commercial Aviation Affairs

COMET ORDER.—United Arab Airlines has announced its intention to purchase two more Comet 4Cs, making a total fleet of seven.

VISCOUNT PURCHASE.—Three ex-Air France Viscount 708s have been leased by Silver City, with an option to buy. They will be delivered before the end of this year and are to be used on scheduled passenger services to Amsterdam, Dusseldorf, Dublin, Belfast, Jersey, Le Touquet and the Isle of Man, and for inclusive tour and charter operation. The aircraft were originally purchased from Air France by Maitland Drewery and have recently been lease-operated by B.K.S. The lease arrangements were handled by Keegan Aviation.

CONVAIR ORDER.—Cathay Pacific Airways is reported to have ordered a Convair 880-M for delivery early in 1962. It will be used on the Hong Kong-Tokyo service.

PAKISTAN FRIENDSHIP. — The fourth of five F-27s ordered by Pakistan International Airlines has been delivered in Karachi and is now operating the night coach service to Lahore. This and the fifth aircraft have large freight loading doors, provision for external long-range tanks and a gross weight of 42,000 lb.

CONVAIR TRAINING.—Award of a provisional C. of A. to the Convair 990, reported in our previous issue, clears the way for airline crew training to begin. At the present time American Airlines' instructors have completed the flight crew ground school and are now training supervisory personnel who in turn will start to train 75 flight crews in January. Swissair and S.A.S. pilots have completed the ground school and Varig flight crews started the course on Nov. 13.

A.T.L.B. Decisions and Applications

(Scheduled Services only)

Licences Granted

None

Licences Refused

A2098. Skyways Coach Air. Lympne/Manston-Albenga. Incorrectly announced by the A.T.L.B. last week as an approval.

A2108. Dan-Air Services. Liverpool-Paris.

Various. Air Safaris. All outstanding applications.

Applications

A2187. Skyways Coach Air. Luton-Lympne/Manston (opt.)—Beauvais. 50 flights a week (max.) with DC-3, Avro 748 or Constellation, 1962 to 1983. Tourist class passengers and freight at IATA fares.

A2189. Derby Aviation. Birmingham-Jersey-Guernsey. Two flights a week (max.) with Argonaut (or equivalent DC-3 capacity), 1962 to 1967. Tourist class passengers and freight at B.E.A. or similar fares.

LONDON TMA.—The trial revision of the London Terminal Control area (see our issue for Aug. 31, p. 223) has been extended until Jan. 17, after which date it is expected to become permanent. Additional changes effective since Oct. 26 have been an extension of the TMA eastwards over the Thames Estuary and the introduction of new airways between Lydd and Seaford, and between Seaford VOR and Paris West VOR.

CARAVELLE POPULARITY.—Load factors of 75 per cent. have been attained with United Air Lines' Caravelles on the New York to Chicago route. Caravelle operation began on July 14 and nearly 90,000 passengers have flown about 50 million passenger-miles.

T.B.O. EXTENDED.—Delta Airlines has obtained F.A.A. approval to extend the time between overhauls of the General Electric CJ-805 engines in its Convair 880s from 1,400 to 1,600 hours.

U.S. FARES UP?—By a 3 to 2 vote, the C.A.B. has turned down Continental Air Lines' request for a third-class fare on jet services at 25% below the present coach fares. The decision is thought to indicate C.A.B. readiness to grant a general fare increase, as requested by several U.S. trunk carriers (see page 696 of this issue).

ATLANTIC OCTOBER.—Passenger loads across the North Atlantic in October were 3.2% above the level in Oct., 1960, and freight increased by 11.8%. The October passenger load factor, at 59.2%, was the highest of any month since Oct., 1960, when it was 65.1%.

ONE-ELEVEN INTEREST.—Middle East Airlines is reported to be studying the purchase of BAC One-Elevens. An initial requirement for eight has been mentioned, with deliveries to begin in the first quarter of 1964. United Arab Airlines also is said to be interested in the One-Eleven as a Viscount replacement.

NON-SKED MEETING.—The presidents of all U.S. airlines operating non-scheduled flights have been called to a meeting in Washington on Dec. 15 to consider safety precautions and financial conditions. The meeting has been called by the E.A.A. and C.A.B. (see page 693).

(*Continued on page 707*)

B.O.A.C.'s FIRST.—The first VC10 for B.O.A.C. has now left the final assembly jig and is undergoing systems installation at Weybridge. It is the second aircraft on the production line.

Air Transport

The North Atlantic Decision

FIRST reactions to the Minister of Aviation's decision to revoke Cunard Eagle's A.T.L.B.-approved North Atlantic licence were that it was contrary to the intentions behind the Licensing Act. Many of the arguments used to justify the Minister's decision were unconvincing in that they were based primarily on interpretations, however impeccable, of the ambiguous wording of this Act and one argument—that related to B.O.A.C.'s aircraft purchases for the future—was unacceptable.

Second thoughts led inescapably to the conclusion that the decision was both inevitable and right—but not for the reasons initially given (see p. 694). Even the depressing facts that 1961 has been a very poor traffic year on the North Atlantic and that B.O.A.C. is expected to lose £10 million in 1961-62 cannot justifiably be used as arguments against the licensing of a second British carrier on this route.

The justification for the decision rests with the present situation for the air transport business in which—because of the competitive over-purchase by the World's airlines of long-haul turbojets—far too much capacity is already being offered and, even after a return to conditions of normal traffic growth, it will be two or three years before the North Atlantic traffic has caught up with this capacity.

This situation surely provides the one really valid reason for the revocation of the licence and should have been underlined from the start. If this had been done—and if it had been made clear that the decision did not prevent Cunard Eagle (or anyone else) from trying again at a more propitious moment—there would have been much less cause for dismay among the independents.

Obviously the prospect of a later application would have been no comfort to the airline which had already committed itself so deeply—but at least the promise might have helped to remove the impression that the Government, having stated its wish that private airlines should be able to compete on level terms with the State Corporations, was now afraid to face the quite clear implications of this declared policy.

The use of the argument about B.O.A.C.'s aircraft-purchase commitments was particularly unfortunate. Not only because, if this were to be carried to its logical conclusion, no applications to the Board for parallel services could hope to be successful, but because of the circumstances in which this argument has been applied. The Corporation's most recent order, for three additional 707s, was placed only a short time before the Board's hearing of the North Atlantic application—and after Cunard Eagle's order for two 707s had been placed. These 707s, which are nearing completion at Renton, will now be sold.

What it amounts to is that, when measured against the present facts of air transport life, the 1960 Licensing Act has demonstrated its inadequacy—and has done so in a very expensive way for all concerned. It is now clear that adjudication is impossible when this has to be based on vague considerations such as "the existing or potential need or demand for any air service" and "the extent to which any . . . service proposed would be likely to result in wasteful duplication of, or in material diversion of traffic from, any . . . service . . . provided" and when approval is threatened by Ministerial intervention and by the right of appeal.

The costly fiasco of the North Atlantic route-rights case demonstrates the need for new thinking and more precise legislation to meet the problems posed by competition.

Footnote. Speaking in the House of Commons during the civil aviation debate on Nov. 23—two days after the Cunard Eagle decision had been announced—the Minister of Aviation developed the trend of the official thinking on the problem. He said that the fact of B.O.A.C. having the aircraft capacity (actual or on order) to carry all estimated future traffic was "an important factor, but not the only one." He agreed that had it been the only factor the Board "would have been right in thinking that it would tend to freeze the position." The Minister then explained the factors which had really influenced his decision—including the gross over-capacity on the route, the weakening market and the poor trading position of the present operators

£10 Million Loss for B.O.A.C.

AS forecast in our issue of Oct. 5 (p. 444), B.O.A.C. expects to incur a loss of £10 million, after payment of interest on capital, during the current financial year. This was stated by Mr. Peter Thorneycroft, the Minister of Aviation, during last week's debate on civil aviation in the House of Commons. B.E.A. hopes to break even.

Whereas B.E.A. started the year with a fund of £2 million set aside to cover the costs likely to be incurred in introducing new aircraft, B.O.A.C. already had an accumulated deficit of £15 million. The expected 1961-62 deficit was explained earlier as being due mainly to losses by subsidiary and associated companies, to the recession in traffic-growth on the North Atlantic, and to the stoppages and strikes in June and July.

New Approach to Mass Travel

IN a proposal to the C.A.B. last week for low-fare New York-Miami services, Riddle Airlines introduced the idea of much bigger free baggage allowances and greatly reduced excess baggage charges. The present limited allowances and high charges were described by Riddle as "a major deterrent to mass air transportation."

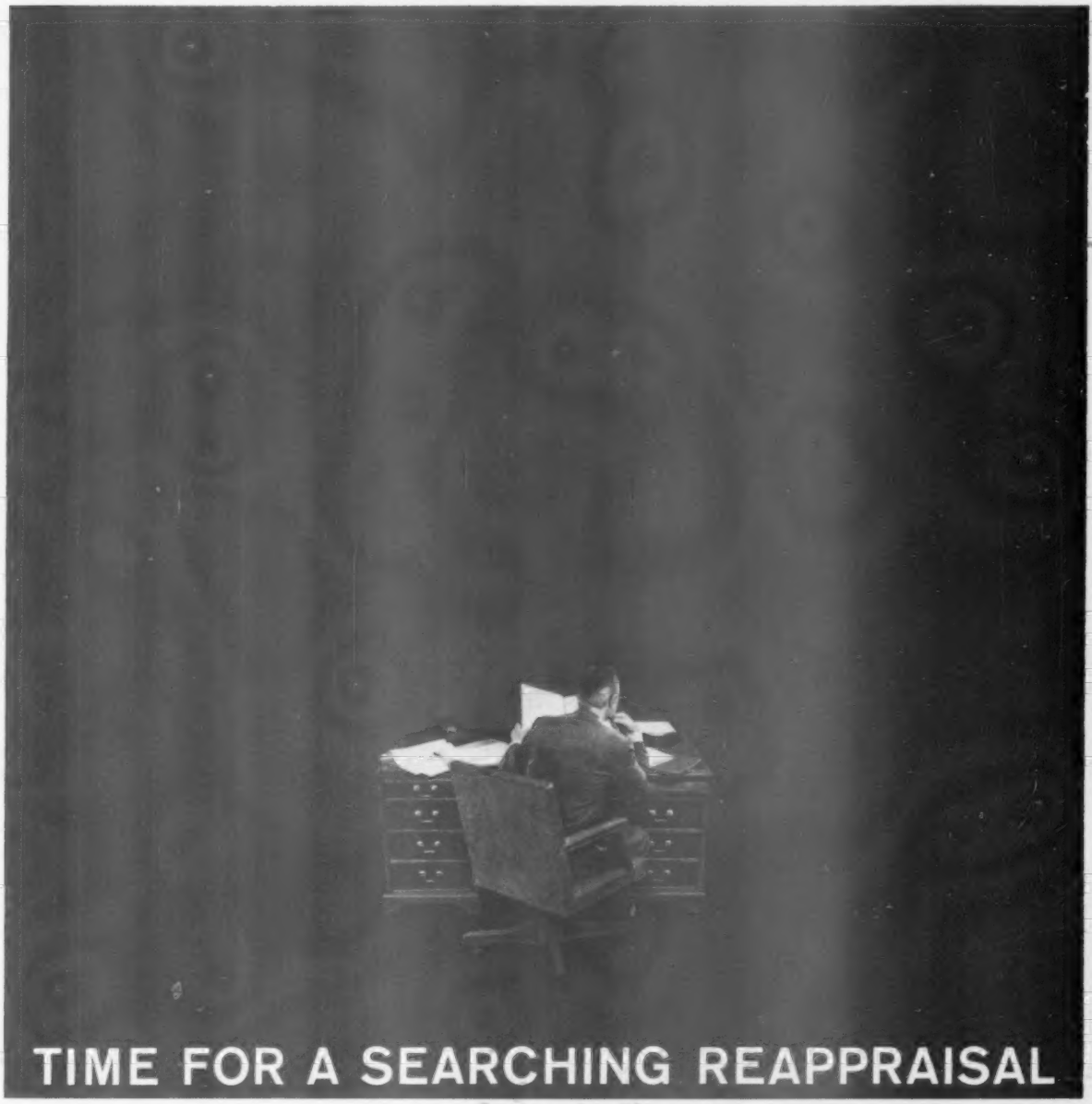
On its Miami services, Riddle proposes to allow 100 lb. of free baggage for each adult (by comparison with 40 lb. normally allowed) and 50 lb. for each child. Excess baggage will be charged at $12 per 100 lb. The proposed single "Thriftaire" fares are $38.03 by day and $29.84 by night. DC-7CFs will be used, with MATS-type seating for 40 passengers by night (plus 40,000 lb. of cargo) and 80 by day (plus 20,000 lb.).

Air Union Delay

THE question of Air Union was expected to come up at last week's meeting of the French Inter-Ministry Committee on aviation in Paris, but discussion of it was postponed for at least a week. The considerations now involved are mainly political, technical issues having moved to the background. A conference between the four civil aviation department heads of the Air Union countries has also been postponed until the French committee has met.

In a Press conference on the day of last week's official meeting, the secretary of the Federation of Transport Trade Unions called on the Minister of Public Works and Transport "to take a firm stand" on Air Union, and criticized in particular the 39% quota reserved for Air France at a time when current results suggest 44% would be a more realistic figure.

LOUNGES ORDERED.—After trials with the prototype mobile lounge shown here and a thorough reassessment of the value of these "waiting rooms on wheels" for moving passengers between airport terminal and aircraft, the F.A.A. has confirmed that they will be used at Dulles International Airport. A contract worth $4,654,660 for 20 mobile lounges has been placed with Chrysler Corporation.



TIME FOR A SEARCHING REAPPRAISAL

In the light of current developments in air cargo, we challenge you to consider this statement. The time has come to make a searching reappraisal of air freight operations if they are being conducted with obsolete piston-powered passenger aircraft that have been converted for cargo. We are convinced that these aircraft, although they may still represent a multi-million dollar book investment, should now be disposed of, notwithstanding current market prices, and replaced by the modern all-cargo Canadair Forty Four. Inevitably, the disposal will result in a "profitable loss," because it can be shown that the Forty Four is the only all-cargo aircraft able to operate at a profit, either domestically or internationally, under the new low freight rates and will recover in a short period of time the losses incurred on the sale of the outmoded converted equipment. Any General Dynamics or Canadair official would welcome the opportunity to discuss this in more detail.

CANADAIR LIMITED, MONTREAL—A SUBSIDIARY OF GENERAL DYNAMICS

Please address enquiries to European Representative: John Winterburgh, Canadair Services Limited, Princes House, 190 Piccadilly, London W.1., England.

Ad. No. CUK-61-1

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THE AEROPLANE and ASTRONAUTICS
NOVEMBER 30, 1961

VICTOR

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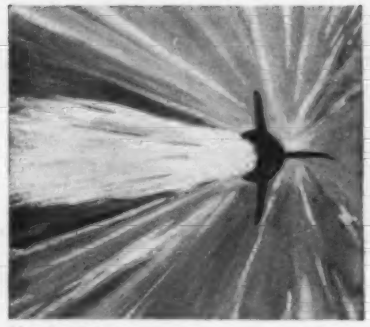


Missile carrier

Reconnaissance

Bomber

While the world sleeps or works or plays, Victors are ready — waiting to fill any of their three roles as missile carriers, reconnaissance aircraft or nuclear bombers.

A single sortie by four Victors can map the whole of a continent.

At three minutes warning Victors can be airborne, retaliating against an aggressor country, carrying weapons with the destructive power of many million tons of TNT.

In the face of such a deterrent sanity decrees that global war is now unthinkable.

HANDLEY PAGE · RADLETT · LONDON · READING

Air Transport . . . .

ARGOSY TRAINING.—The first of B.E.A.'s Argosies was being intensively used for crew training last week after interruptions attributable to the loaders strike at London Airport and to poor weather. Seen in the cockpit going through a pre-flight check are Capt. Roy Pigden, the training captain (left-hand seat), Capt. Bill Ferries (right-hand seat) and S.F.O. Bert Niven. Below, the Argosy gets airborne.

Photographs copyright "The Aeroplane and Astronautics"

The Aeromex Plan

PLANS to merge the three existing Mexican airlines into a single organization known as Aeromex were officially announced in Mexico earlier this month. The new company will be floated with 60% Government funds and 40% private capital. Among the private investors will be General Dynamics Corp. and Sr. Don Carlos Trouyet, who (see our previous issue) recently acquired control of Guest Aerovias. General Dynamics is expected to provide Convair 880-M or 990 jet transports plus maintenance arrangements, crew training facilities, spares and ground equipment on a hire basis.

Details of the management of Aeromex have not been given, but local reports tip the multi-millionaire banker industrialist and ex-President of Mexico, General Abelardo L. Rodriguez, as the first president of the airline, and Sr. Don Ramos, the highly respected ex-general manager of Aeronaves, as the chief executive.

Aeromex is not likely to supersede the three individual airlines until well into 1962. Meanwhile, all three continue to struggle against various difficulties, as we described last week. Mexicana believes it has temporarily avoided the threat of liquidation, and Guest Aerovias recently prevented a strike by conceding to its employees' demands. Aeronaves, however, has been at a standstill since Nov. 10 because of a strike of flight crews.

Pan American severed its link with Mexicana on Nov. 1 and has set up its own operational department in Mexico. Maintenance and ramp services will be arranged for Pan American by Mexicana.

U.S. "Non-Skeds" Face Inquiry

AT a time when the safety record and financial stability of the British independent airlines have been exposed to critical public scrutiny, a comparable group of U.S. airlines is also undergoing both a Government inquiry and a public inquisition. The accident to an Imperial Airlines' Constellation on Nov. 8, following the equally disastrous crash of a President Airlines' DC-6 at Shannon last September, led the C.A.B. and F.A.A. jointly to investigate these operators' safety records, financial status and business practices; Congress has meanwhile appointed a committee to investigate their use in carrying military personnel.

Pending the outcome of a separate investigation to be conducted by MATS, the Department of Defense last week stopped using seven supplemental carriers for military charter flights. There are 25 such airlines holding C.A.B. certificates which allow them to fly up to 10 services a month between any pairs of cities they wish, and to operate domestic charter flights without limit on frequency. Those airlines which were named by the Department of Defense are Imperial, President, Saturn, American Flyers, Modern Air Transport, Worldwide and Associated Air Transport.

According to C.A.B. records, the supplemental carriers have been flying between one and two million revenue passenger-miles a year for the past 10 years on civil and military flights. From 1949 to 1960 there were 23 fatal accidents in which 509 passengers were killed. The accident rate has been as high as 17.87 per 100 million passenger-miles in a year and was 4.25 in 1960. A profit has been recorded by the supplemental carriers as a whole in only three of the past nine years.

B.O.A.C. Equipment Change

WITH three additional Boeing 707s for delivery next year and a general scaling-down of capacity to be offered on the North Atlantic routes, B.O.A.C. will be able to up-grade the equipment standard on other routes during 1962. The most important development will be the introduction of Boeings on the Tehran-Hong Kong sector, to link at Hong Kong with the existing westabout 707 service. The effect of this will be to provide a one-aircraft round-the-World operation.

Following the end of the Atlantic season in October, 707s will become available to operate twice a week between London and Sydney. This in turn will free Comets for West and East African routes, from which Britannia 102s will be retired before the end of 1962. These aircraft, of which the Corporation has 14, will then be offered for sale, after less than six years' service.

Northeast Operations Continue

THE Civil Aeronautics Board was to consider yesterday (Nov. 29) the financial plight of Northeast Airlines (see our previous issue) and the question of emergency financial aid for the company. Pending a C.A.B. decision, Northeast has been able to arrange for interim credit for its fuel and oil, credit supplies of which the Shell Oil Co. had threatened to suspend on Nov. 17.

The C.A.B. was to take evidence from Northeast, Hughes Tool Co., Eastern Air Lines and National Airlines. Eastern and National are major competitors of Northeast on the important New York-Florida route, and both are opposed to Hughes obtaining control of the airline. They believe that Hughes' interest in Northeast is linked with his ownership of 13 Convair 990s (which were intended for T.W.A.—see our issue for Aug. 24). Use of these aircraft backed by Hughes' vast resources would, say Eastern and National, drive them from the New York-Florida route and into financial distress.

Air Transport . . . .

Cunard Eagle's Atlantic Licence Revoked

THE Minister of Aviation has upheld the appeal by B.O.A.C. against the A.T.L.B.'s approval of a 15-year licence to Cunard Eagle for a daily return service between the United Kingdom and the U.S. East Coast. This decision, which is final, was made known on Nov. 21 and follows the recommendation of the Commissioner (Sir Fred E. Pritchard, M.B.E.) who heard the appeal on Sept. 26-29.

The principal reasons for the recommendation were that B.O.A.C. had purchased aircraft to cater for all the traffic which might reasonably have been expected on the route over the next five or six years; that the Board had not found that there was existing or potential need or demand for the additional licensed service; that the Board considered that there would be a diversion of traffic—and probably a "material" diversion—if the licence were granted; and that, in approving the licence, the Board was not exercising its function under the Act "in such a manner as to further the development of British civil aviation."

The later evidence, to the effect that North Atlantic traffic had not increased as expected during 1961, did no more than "confirm the irresistible conclusion" to which the Commissioner had been "driven" by the original evidence.

The Commissioner's decision appears to have rested partly on the appearance of inconsistency in the Board's reasons for the approval and partly on the importance of the first five or six years of the validity of the licence—a point stressed in the Minister's explanation of his decision. In particular, the Commissioner's recommendations refer to paragraphs 18, 19 and 24 of the Board's report. The appropriate parts of these read:—

"Having regard to the volume of East Coast traffic and its rate of growth, we do not think that a licence to a second United Kingdom operator in the terms granted [one return service daily] will cause duplication which can be described as 'wasteful'."

"To an extent which we have no means of assessing, the advent of another operator . . . may generate new traffic; but there will be diversion, and probably 'material diversion' from B.O.A.C. . . ."

"We accept the evidence of the Corporation that they have reasonably entered into financial commitments, notably in regard to aircraft purchases, designed to cater for all the traffic which they might reasonably have expected to carry on this and on all their other routes over the next five or six years. We do not regard this as precluding the advent of a second United Kingdom operator on the United States East Coast route as now licensed."

In the course of its explanation of the reasons for agreeing with the Commissioner's recommendation, the Ministry of Aviation comments that two considerations, in particular, "weighed heavily" with the Board. These were:

"The view that, if the licence were refused to the second operator on the ground that the second operator would cause material diversion from the existing British operator, this would freeze the situation on the route in question and all other routes and the Board could not believe that this was the intention of the Act.

"The expectation that the traffic would grow to such an extent and so rapidly that the additional capacity offered by a second operator would still leave ample room for the first and that, in any event, the total volume of the traffic, and the British share thereof, would be increased."

The explanatory letter giving the Minister's view goes on to say:

"On the first of these considerations, the Minister does not dissent from the Board's view that it was not the intention of the Act to freeze the existing situation, but equally he does not consider that a decision to withhold a licence on the ground that it would materially divert traffic from the existing British operator would necessarily have that effect. All the circumstances of the particular route . . . must be taken into account. The circumstances of one route will plainly differ from the circumstances of other routes.

"As regards the second point, with regard to the effect of a second operator on the growth of the traffic and Britain's share of it, the Minister does not dissent from the view that a second operator would have some effect, at any rate in the immediate future, on attracting traffic from foreign carriers; but he considers that the extent to which this would be of lasting effect on the British share would, taking all the factors—domestic and international—into account, be highly problematical.

"It may be that the introduction of a second operator would generate some new traffic, although no convincing evidence in support of this view appears to have been presented to the Board. Indeed there are inherent difficulties in the presentation of any such evidence when all the carriers are offering the same levels of fares and basic standards of service to the public. . . ."

So far as the 1961 setback in North Atlantic traffic growth is concerned, the letter comments that the situation will be remedied "as the resumption of a high rate of traffic growth takes up the slack in the available capacity, but he [the Minister] finds it difficult to believe that the balance will correct itself rapidly enough to avoid waste of capacity and serious financial consequences for the principal British operator, especially if another carrier is introduced to the route." The letter continues:

"The Board have rightly pointed out that the effect of the material diversion from B.O.A.C., which they think probable, will diminish by reason of their decision to limit the licence to one return service a day by Cunard Eagle. But all the argument and evidence were directed to the next five or six years. This is the period for which B.O.A.C. have entered reasonably and prudently into financial commitments for the provision of aircraft and equipment. It is in this period, when they are least able to bear it, that the impact of material diversion will be at its greatest."

Cunard Eagle, commenting on the decision, said that, following the encouragement given by successive Ministers of Aviation, the company had spent considerable sums and had put in a great deal of hard work on the assumption—which in logic they could reasonably make—that the licence would be granted.

"The reasons given for the rejection are twofold. The first, that B.O.A.C. have ordered sufficient aircraft to cater, not merely for the transatlantic route, but for all other routes, implies that there will be a State monopoly everywhere for the foreseeable future.

"The second, the falling off of transatlantic air passenger travel during 1961, is odd in view of the Minister's recent statement that this falling off was due to exceptional circumstances and represented no more than a 'kink in the graph.'

"We still believe that competition is as good for the nationalized airlines as for a private concern. We still maintain that Cunard Eagle could provide a transatlantic service second to none."

Mr. L. C. Hunting, president of BIATA, said:—

"Presumably this means that, by virtue of B.O.A.C.'s present order book for new aircraft, no new licences of a competitive nature can now be granted for at least five or six years.

"If this is right, we should be grateful if we could be told categorically, so that we can stop wasting everyone's time and our money."

B.U.A. Drops African Applications

BRITISH UNITED AIRWAYS withdrew its applications for scheduled services to African destinations on the second day of the public hearing into these and other applications by the A.T.L.B. The withdrawal followed an unsuccessful attempt by B.U.A. to obtain an adjournment "until the Minister's ultimate intentions have been obtained."

B.U.A. took the view that the grounds on which the Minister had decided against Cunard Eagle in the transatlantic route case (see above) could apply to every application for a service in competition with either of the Corporations and that the proceedings of the A.T.L.B. were therefore "a farce."

The application for an adjournment *sine die* was made by Mr. Gerald Gardiner, Q.C., representing B.U.A. He suggested that the adjournment should be long enough for the outcome of the European routes case—and of any appeals arising therefrom—to be known, as these might give a better indication of the Minister's intentions towards the independent airline companies. Meanwhile, B.U.A. was not prepared to go on spending large sums of money on the proceedings.

B.O.A.C., B.E.A., and Starways, the only other companies involved in the hearing, opposed the adjournment and the Board, under its deputy chairman, Mr. J. J. Taylor, declined to adjourn. The B.U.A. contingent then walked out of the meeting.

The British United case for a service round the West African coast to Lagos had been made on the first day and the Board will decide on this in due course. No case was made for licences on the routes to Johannesburg and Mauritius, and B.U.A. did not proceed with its objection to the B.O.A.C. application to add traffic stops in the Belgian Congo to its African services.

B.E.A. also withdrew its objection to the B.O.A.C. applications after B.O.A.C. had agreed not to ask for London-Brussels traffic rights as originally suggested (see our issue for Nov. 16, p.639).

Starways are seeking a maximum of two flights a week on the route Glasgow-Liverpool-Manchester-Gibraltar-Bathurst-Freetown-Accra-Lagos, using Viscounts or DC-4s. Their case rests on the traffic potential between shipping ports which already have commercial links. It was opposed by B.E.A. in respect of the U.K.-Gibraltar segments and by B.O.A.C. in respect of Accra and Lagos.

VEHICLE LIFT.—This is the Aviation Traders (Engineering) answer to the Channel Air Bridge requirement for a vehicle/goods lift for the ATL-98 Carvair. Another variant was illustrated in our issue of Sept. 28, p. 438.

The Battle for Traffic Rights

AFTER 16 days of negotiations, Italy and the U.K. have reached an agreement regarding the modification and extension of the existing bilateral treaty governing air traffic rights. The new agreement covers a period of five years and establishes new route schedules to replace those in the existing agreement. No details of these schedules have been made public by either side, nor is it known when they take effect.

The long-protracted discussions in Rome, conducted by Mr. M. Custance on behalf of M.o.A., indicate that agreement was reached only after some fairly hard bargaining. In the circumstances, however, both sides are to be congratulated that they have achieved final accord.

The situation between Italy and the U.S.A., on the other hand, is not so happy. Negotiations, as has already been reported, were broken off and there is not yet any sign of either side modifying the position it has taken. Italian opinion, as reflected in informed articles in the daily Press, is one of considerable dissatisfaction with the U.S. It is pointed out, for instance, that Italy has spent over £35 million in the U.S. since 1959 in re-equipping Alitalia's fleet and that, if the company is not able to make the maximum use of these aircraft, which means to employ them to the full on transatlantic routes, it will suffer a serious financial loss.

Italy, however, undoubtedly feels that she is in a strong bargaining position—certainly a much stronger position than in 1946, when the original bilateral treaty between the countries was drawn up. The strength of Italy's position lies in the fact that Rome is a staging point on T.W.A. and Pan American routes which cannot easily be substituted.

If this affair should deteriorate into an actual diplomatic war of attrition, the consequences for Italy could be very serious. How fully this is realized it is difficult to say. Italy's attitude has hardened very considerably and an Alitalia official spokesman, when asked what Italy's next step was likely to be, replied bluntly that the treaty would be renounced. On the other hand, it is also certain that the two U.S. companies operating through Rome will be badly hurt if their schedules are restricted or stopped.

The Italian attitude is also fortified by the fact that Italy is not the only European country seeking traffic rights on the West Coast. Nor is it the only country in Europe which has objected strongly to providing the U.S.A. with details of its traffic statistics—in particular the "point of origin" of an air journey as defined by the U.S. authorities—as a condition to the granting of such rights. If such statistics were provided, the U.S.A. would, of course, raise objections to Italy, or other European countries, carrying passengers whose journey did not originate in that country—this being direct competition with U.S. airline companies. If the reaction in Italy is anything to go by, it looks as if the U.S.A. may well have underestimated the opposition there would be from Europe to their conditions.

Fortunately, renunciation of the treaty is not quite as drastic a move as it at first sounds. Such an action results in the automatic freezing of the status quo for a given period (six to 12 months), which should provide ample time for both sides to reconsider their position, to reflect upon the futility of reciprocal punitive measures and even, perhaps, to think of the convenience of their paying customers.—T.D.C.

B.E.A. in September

PASSENGER traffic carried by B.E.A. in September was 14.3% above the level in the same month of 1960. The growth rate was the same as that recorded in August and although substantial, was lower than expected. Consequently, the passenger load factor fell by six percentage points. Provisional figures indicate an 18% growth rate in October, but even this was below expectation. In the year concluded on Oct. 14, B.E.A. carried two million passengers on its domestic services—a new record.

	September 1961	September 1960	Variation
Capacity ton miles offered ..	30,197,000	24,665,000	+22.4%
Load ton miles sold	20,011,000	17,817,000	+12.3%
Revenue load factor	66.3%	72.2%	− 8.2%
Passengers carried	518,018	458,577	+12.9%
Passenger miles flown ..	190,384,000	166,525,000	+14.3%
Passenger load factor.. ..	68.3%	74.9%	− 8.8%
Freight ton miles	1,524,300	1,470,800	+ 3.6%
Mail ton miles	322,500	332,400	− 3.0%
Aircraft miles flown	4,224,900	4,182,400	+ 1.0%
Revenue hours flown ..	19,048	20,344	− 6.4%

In the third quarter of the year—always the most profitable on B.E.A.'s highly seasonal operations—the Corporation made a profit of nearly £3 million. Revenue in the first six months of the present financial year has been below budget and it is likely that the operating account for 1961-62 will show a deficit.

PVD EVALUATION.—K.L.M. has become the first commercial operator to install a Smiths ParaVisual Director (PVD) system in a turbojet transport. Fitted in this DC-8 for evaluation on the North Atlantic, the installation is to be raised to "second-stage" level to give flare-guidance during approach and landing.

Air Transport . . . .

Critical U.S. Airline Trends

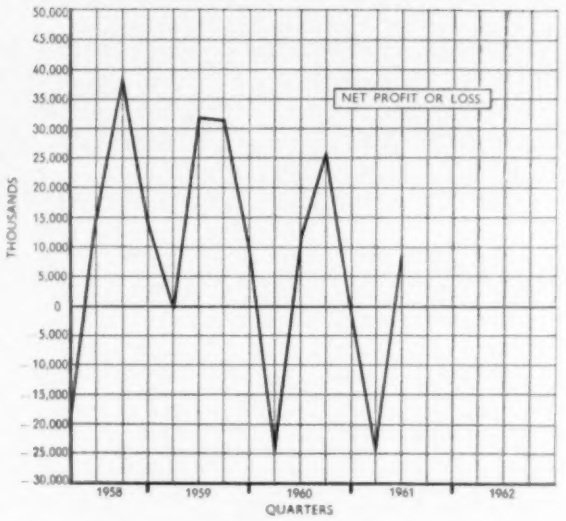
TABULATED below, in the first of a regular series, are traffic results for the U.S. scheduled airlines in the second quarter of 1961. A separate table shows the financial results for the second quarter. The statistics are based on those provided to the C.A.B. by all the scheduled U.S. airlines.

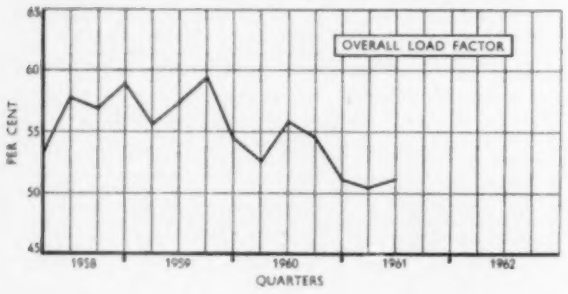
The graphs show the quarterly trends since 1958 and indicate the problem which now confronts the U.S. industry. While revenue ton-miles continue upward, the trend both of overall load factor and of net profit is downward. The financial position is now critical, as indicated by the plight first of Capital and then of Northeast this year. In the first nine months of 1961, the 11 U.S. trunk airlines reported a net loss of $16.9 million, compared with a net profit of $5.1 million in the same period of 1960. An operating profit of $9.3 million was made in this period, compared with non-operating expenses and income tax of $26.2 million.

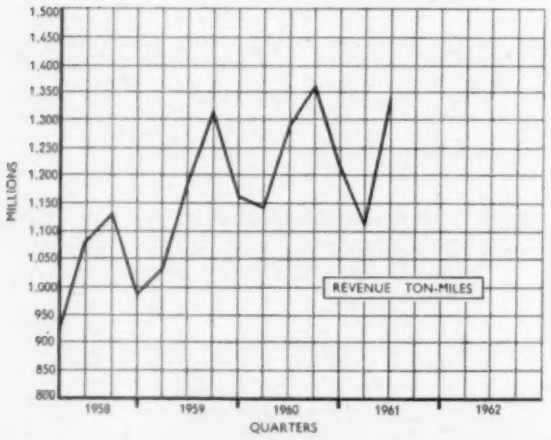
Reduced to its simplest terms, the problem is one of excess capacity and over-competition (*vide* J. W. S. Brancker, writing in our previous issue). In the absence of a positive lead from the C.A.B., individual airlines are seeking a variety of means of boosting revenues without increasing expenses.

Fare increases on some or all types of service are at present being sought by National, United, Braniff, and Eastern. Other companies, conversely, are planning promotional fare reductions, among them T.W.A. and Continental, although half-price youth fares, introduced in September, have already been abandoned. A reduction in cabin service on domestic flights, perhaps to the extent of serving no refreshments at all in coach-class services, is also being considered.

In this generally gloomy picture, one of the brightest spots is the progress made by "air bus" and "air shuttle" schemes. Typified by the Eastern air shuttle between New York and Boston and New York and Washington, these have been the most effective of recent measures to tap new markets. Eastern is extending its air-bus services—a low-fare, no-frills operation for which reservations cannot be made by telephone—and National is seeking permission to start a similar service. There is a growing weight of opinion in the U.S. that the future stability of the airline industry depends on attracting passengers who normally travel by car, and the air-bus and air-shuttle service may prove one way to do this.







FINANCES, SECOND QUARTER 1961

	Total operating revenue	Total operating expenses	Net profit or (loss)	Change
	(000)	(000)	(000)	%
Domestic trunklines	$524,761	$503,853	$2,046	−68.2
International and overseas airlines	$179,758	$164,968	$3,733	−62.6
Local service airlines	$45,290	$41,855	$1,960	*
Territorial airlines (intra Hawaiian)	$3,373	$3,313	($64)	*
Alaskan airlines	$11,314	$8,987	$1,574	+123.3
Helicopter airlines	$2,129	$2,283	($48)	*
All-cargo airlines	$20,467	$20,955	($959)	*
Total U.S. industry	$787,092	$746,214	$8,242	−29.7

* Changed from a profit to a loss or vice versa.

TRAFFIC, SECOND QUARTER 1961

	Available short-ton miles		Revenue short-ton miles		Overall load-factor		Revenue ton-mile traffic				Seat-miles		
	—	Change	—	Change	1961 qtr.	1960 qtr.	Pass.	Freight*	Mail†	Non-scheduled	Available	Sold	Pass. L.F.
	(000)	%	(000)	%	%	%	(000)	(000)	(000)	(000)	(000)	(000)	%
Domestic trunklines ..	1,781,845	9.8	875,912	2.2	49.2	52.8	724,213	105,801	41,697	4,201	13,097,251	7,622,873	58.2
International and overseas airlines ..	609,491	31.0	325,340	12.4	53.4	62.2	221,365	49,152	36,700	18,123	3,935,053	2,216,762	56.3
Local service airlines ..	83,292	17.0	36,465	14.3	43.8	44.8	32,821	1,980	1,033	631	813,165	345,554	42.5
Territorial airlines (intra Hawaiian)	4,937	−44.5	2,838	−44.2	57.5	57.6	2,368	436	31	3	47,781	29,621	62.0
Alaskan airlines ..	20,101	7.5	12,719	8.7	63.3	62.6	5,832	2,695	1,278	2,914	113,255	55,006	48.6
Helicopter airlines ..	572	− 0.3	261	−11.2	45.6	51.2	224	13	24	—	4,781	2,349	49.1
All-cargo airlines ..	109,060	−14.5	83,397	−11.9	76.6	74.2	—	30,684	3,240	49,473	—	—	—
Total U.S. industry ..	2,609,298	12.7	1,336,932	3.6	51.2	55.7	986,823	190,761	84,003	75,448	18,011,286	10,272,165	57.0

* Includes express. † Includes priority and non-priority U.S. mail, foreign mail and excess baggage. Columns headed "Change" are comparisons with second quarter, 1960.

OPtional Reading—22

IT is time that I moved away, for a while, from the approach-accident case, but before doing so there are a few ends to tie in; I should also like to put the whole theory into some sort of perspective.

Having had a week or two now in which to reflect on the three accidents which I used for test purposes (OPtional Reading 20 and 21), I am inclined to think that the theory stands up pretty well. I made out the general case—the table in OPtional Reading 19—before trying out the theory against specific accidents and was prepared to see the chips fall where they might.

In the case of the Singapore Constellation and the La Guardia Electra it seems fairly clear that the approach speeds used had predisposed the aircraft to an accident with a degree of probability (at least 10^{-4}) which is generally recognized as unacceptable. With the Nairobi 707 the case stands or falls on the figures used for *g*-loading and for these we had to rely on an estimate. The theory is, therefore, not so strongly supported here; neither, however, is it disproved. If we accept the figures, they seem to show that the aircraft, during the arrest of descent, was flown at a speed predisposing it to buffet or high sink rate (both being associated with a marked loss of lift), but that it was quite in the clear (i.e., probability less than 10^{-4}) so far as actual stalling was concerned; this fits in very well with the fact that, on opening up after the premature touchdown, the aircraft flew away without difficulty.

The above are the only three cases I have looked at and to me they appear to lend definite support to the general theory and, within the limitations of the probability method, to a criterion of about 10^{-4}. I do not think that it is up to me to go through all the other undershoots in order to find ones that disprove it. That is what this journal's correspondence columns are for. However, I would not like to put the ideas up in any absolute form and there may well be cases where the theory has only limited application.

For example, some operators issue definite instructions to the effect that the aircraft must not be flared till it is over the runway; in this case the *g*-loading element will not apply until a very late stage in the approach and should not be added to the gust. However, other operators issue no such instructions and in adverse circumstances (e.g., wet, critical-length runways) the pilot, conscious of the overshoot hazard, may be reluctant to apply this method and may seek to flare out well in advance so as to float in, drop the aircraft on the runway and step on the brakes early. On the whole it can be said that, whether by positive instructions or by an intuitive reaction to the early record of undershoots, pilots are now coming over the threshold with a reasonable margin, the average in fine weather being nearer to 1.4 than 1.3Vs. In the U.K. the whole stress, at least of the certificating authorities, is that 1.3 is a *minimum* threshold speed: however, I know of one foreign authority which permits 1.2Vs and I do not think therefore that the case has been overstated.

What has happened over the past two years is that the problem area has moved away from the undershoot (in the U.S., one in 1960 against six in 1959) towards the overshoot, or veer-off the runway. I plan to discuss this feature at a later date but, as the problem is only now under systematic study (notably by the F.A.A. and the A.R.B.), I do not think that it would be helpful to comment. Nor do I think that it is going to be anywhere near as easy to assess statistically the predisposition of the aircraft to overshoot as it has been in the case of the undershoot: the piling of the probabilities one on top of the other (threshold speed, touchdown speed, time to brake and/or reverse) coupled with the uncertainty of runway braking coefficient lead to some complex mathematics which I shall find difficult to cope with. But I do not propose to let those difficulties prevent me from laying stress on the approach accident: after all most of these lead to fatalities while, in the case of the overshoot, fatalities are very rare.

What positive remedies have I to offer? The simple answer is, of course, larger threshold margins and longer runways. Neither is easy to satisfy, but perhaps the solution is not altogether beyond us in the period immediately ahead. For example, greater threshold margins could easily emerge from developments of the blown flap or from boundary layer control; but, until more lift is secured by methods such as these, the only course would seem to be to put up the minimum threshold speeds so as to take care of all anticipated combinations of gust and *g*-loadings and, if that runs the aircraft into an overrun problem, then additional stopping devices should be used—arrester-hooks, parachutes, larger air brakes, lift spoilers, and overrun areas specially engineered for safe deceleration. All these solutions are within the grasp of the industry and should be considered for application on a case by case basis. Boeing (see the issues of July 13, p. 33, and Oct. 5, p. 450) has been using the Dash-80 for flap, anti-skid brakes and boundary layer experiments. They cannot go ahead on these too fast.

I have little doubt that, whether my theories are agreed or not, there will be a certain amount of examination by pilots and operators of the true speeds of the stall and the true safety margins applying during the final segment of the approach. But I have rather more doubt whether accident investigators will examine the problem unless it is spelled out to them in a handbook. Perhaps they should all be issued with copies of OPtional Reading 13 to 22? Alternatively, if the Cairns Committee's proposals—for Assessors to be drawn from permanently appointed panels—are accepted by the Government, the operations group could be given a short course in performance, a subject clearly not fully appreciated by so many Inquiry Boards. At least they would then ensure that such elementary data as stall speeds, air speeds and wind speeds are always given in the report—perhaps even *g* readings from the flight recorder, an item not mentioned in the Nairobi case wherein it could have had the greatest relevancy.

When, in 1854, the anæsthetist, John Snow, concluded from the distribution of cholera that it was caused by a water-borne micro-organism and secured the tying up of the handle of the Broad Street pump, he was ridiculed by the professionals; but the spread of the disease was arrested and eventually the vibrio was isolated (by Koch) 29 years later. Similarly, when C.C.J. concludes from the distribution of undershoot accidents that they are associated mainly with a *g*-loading-cum-gust combination . . . but modesty prevents me from speculating further on the analogy. Suffice it simply to say that I see no reason to go out on this subject on any different note from that on which I came in (see OPtional Reading 4)—namely, " until someone gives me the statistical measure of wind-speed variability near the ground, the A.S.I. position error at full flap and high angles of attack, the A.S.I. system and instrumental variabilities, the true margin of the equivalent airspeed over the one-*g* stall, the temporary increase in stalling speed due to the extra loading of the round-out action and the value of ground effect from 50 ft. downwards, I will continue to believe that many of today's landing problems are due to yesterday's ' mush effect '."—C.C.J.

Lower Limits for the Caravelle

THE Astronics Division of Lear is at present engaged in two independent programmes to provide lower operating minima and all-weather landing and take-off capabilities for the Caravelle. One is being conducted with Air France with the object of an immediate lowering of the present weather minima (300 ft. and ½-mile) down to 100 ft. and ½-mile, and the other, sponsored by the F.A.A. and the French Air Ministry, is being undertaken jointly with Sud Aviation.

Divided into three phases, the Sud-Lear design and development programme involves the use of existing ILS equipment, an improved radar altimeter, instantaneous rate-of-descent sensors, automatic throttle control and the present Lear L-102 autopilot installed in the Caravelle. Phase one, which started in July, is to provide the automatic throttle control and improved approach-coupler control. Phase two includes an automatic computer capable of landing the Caravelle within ± 250 ft. of the average touchdown point. Phase three is to determine the safety requirements of the equipment and the necessary pilot monitoring presentations in the cockpit.

A Lear B-26, based at Santa Monica, is being employed to develop the breadboard hardware of all systems prior to the delivery of prototype equipment for flight testing in the Caravelle next month. Display systems to be evaluated in phase three include the Smiths ParaVisual Director, a Lear vertical-tape instrument providing absolute altitude and vertical velocity information and flight-director type of indicators. It is estimated that a prototype automatic-landing computer will be ready for installation in a Caravelle by the latter part of 1962, and that approximately 200 hr. of flight evaluation will be completed by Sud.

The Air France Caravelle programme is aimed at lowering the landing minima to 100 ft. and ½-mile with the least amount of modification to the L-102 autopilot and re-certification of the aircraft. Results to date, using a Lear-owned Learstar based in Geneva, indicate that the present L-102 approach coupler is entirely adequate for controlling the Caravelle down to a lower minima of 200 ft. and ½-mile. But improved glide-path control is required for a height limitation of 100 ft.

Features to be added to the basic Caravelle autopilot system include eye-level indications of the engaged autopilot modes; autopilot control through the pilot's column; a test control system on the pilot's mode selector; modification to the aircraft's existing radar altimeter; and the automatic throttle-control system developed for the Sud programme.

Bringing Home the

Rogallo research the boo article

ONE of the most cherished ideals of the space-rocket designer is that one day he will find the solution to the problem of salvaging the costly initial stages of his boosters. Much attention at the present time, for example, is being given to the question of recovering the S-1 stage of Saturn, which has become something of a contest between the advocates of the so-called Rogallo-wing concept, or Ryan Flexwing "para-glider," and those who see the solution in a parachute system.

With the Rogallo-wing, it is the aim to return the empty booster to a dry landing on an air-mattress landing strip, while the parachute system would serve merely to drop the booster directly into the sea. In the latter case, final touch-down would be eased by downward-firing retro-rockets set off when the vehicle is within a few feet of the water.

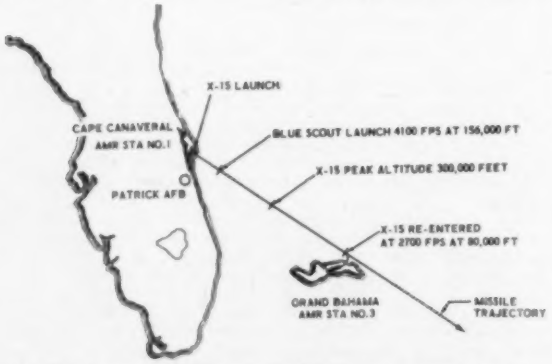
At present the desire to recover the Saturn booster is not so much to re-use it but to enable close inspection to be made of the complex internal systems and, in the words of Dr. Wernher von Braun, to "see whether our 1,000 channels of telemetry are telling us the truth about the information they send back from a flight."

Preliminary ideas within NASA on the use of the Rogallo-wing (illustrated in THE AEROPLANE AND ASTRONAUTICS, Oct. 26, 1961, p. 544) is that after a Saturn launching from Cape Canaveral, the booster might be returned to land either at Grand Bahama Island or back at the Cape. The proposal is that the para-glider should be actually guided down from the ground by means of Saturn's guidance system. Lines attaching the wing to the booster would be pulled in and out to adjust the "kite" as it approaches the landing strip.

The landing mattress itself might be placed on an open beach and inflated to 5-10 p.s.i. Arrester wires would be strung across the approach end and the booster, embodying three landing skids and a trailing hook, would be guided in with the aid of a beacon and mirror landing system at the far end of the mattress. The estimated landing speed is about 60 knots.

It goes without saying that it would be no mean trick to guide the kite-supported booster to an effective landing of this kind and, in fact, one of the principal arguments against the scheme is that the glide-range of the Rogallo-wing is likely to prove inadequate. This raises the question of providing the system with some form of power assistance—at the expense of a further payload penalty for the booster.

Indeed, because of this difficulty, the advocates of the parachute technique appear to have the edge on those who prefer the Rogallo-wing, although the situation is still not finally resolved. With parachute recovery, sea-water contamination must be taken into account, but studies carried out by NASA have indicated that this may not be a too-serious obstacle; in any case, it would be quite adequate for the purposes of post-flight inspection. There is now talk of attempting recovery of a Saturn booster after the fourth or fifth R. and D. launching.


X-15 LAUNCH
CAPE CANAVERAL AMR STA NO.1
BLUE SCOUT LAUNCH 4100 FPS AT 156,000 FT
X-15 PEAK ALTITUDE 300,000 FEET
PATRICK AFB
X-15 RE-ENTERED AT 2700 FPS AT 80,000 FT
GRAND BAHAMA AMR STA NO.3
MISSILE TRAJECTORY

A typical mission for the recoverable booster system is shown in this drawing of the Atlantic Missile Range. Separation of Blue Scout from the X-15 would occur a short distance from Cape Canaveral at 2,800 m.p.h. and at an altitude of 156,000 ft. B-52 operations would be performed from Patrick Air Force Base.

In a launching from the Pacific Missile Range, the centre of operations would primarily be Edwards Air Force Base, with the X-15 launch station above the ocean near Point Mugu and Oxnard. Vandenberg would be the normal X-15 landing base.

Manned Boosters

While deliberations on the prospective methods of Saturn recovery continue, another type of recoverable booster system, of considerable novelty, has been offered as a means of launching small satellite vehicles and space probes. It involves nothing less than use of the Boeing B-52 bomber as the first stage, the X-15 research aircraft as the second stage, and a modification of the Blue Scout rocket as stages three and four. The basis of the proposals, which North American Aviation and the Aeronutronic Division of Ford Motor Co. have put to various Air Force commands throughout the United States, is that the cost of placing payloads deep into space or into orbit around the Earth would be significantly reduced by the recovery of the B-52 and X-15.

The Blue Scout, for which Ford's Aeronutronic Division are prime contractor, in its four-stage version, is the U.S.A.F. equivalent of the Chance Vought Scout developed for NASA. Use of the two aircraft as first stages, it is claimed, would eliminate the need for the two lower stages normally employed for ground launching from Cape Canaveral. The air-launched rocket stages would, therefore, consist of the Hercules ABL X-258 and ABL X-259 for guided missions.

For unguided launch operations, use would be made of the Hercules ABL X-259, the Aerojet 30 KS 8000 (AJ-10) and the Naval Ordnance Test Station NOTS 100A, a small spherical rocket motor used for orbit injection.

The successful marriage of the B-52 and X-15 has been handsomely demonstrated over the past several months in the increasing speeds and altitudes reached by the rocket-powered research aircraft. North American have produced a total of three X-15s for the joint U.S. Air Force, U.S. Navy, NASA research programmes. With U.S.A.F. Major Robert White at

Booster

-wings and use of the X-15 rocket-powered aircraft are among schemes for recovering ster stages of space vehicles reviewed in this

by KENNETH GATLAND

the controls on Nov. 9, the Number One aircraft established a new record speed of 4,093 m.p.h., which was reached at an altitude of 95,800 ft.; under the prevailing test conditions this was equivalent to Mach 6.04.

Earlier, on Oct. 11 in the second aircraft, Major White reached a record altitude of 217,000 ft., and attempts are now being made to extend this above 250,000 ft. Two B-52 bombers have been assigned to the X-15 programme and modified to carry the research aircraft on its high-altitude missions.

In the rôle of rocket launcher, the idea would be for the B-52 to climb with the X-15 attached to the starboard-wing pylon, in the usual way, to an altitude of 45,000 to 50,000 ft. The rocket plane would then be released, whereupon it would proceed to climb under the impulse of its 57,000-lb. thrust Thiokol XLR-99RM-1 engine to an altitude of approximately 156,000 ft. for high-speed launching of the Blue Scout rocket. While the B-52 parent aircraft cruises below, the X-15 would coast up to an altitude of 300,000 ft. before returning to the Earth's atmosphere, completing the re-entry at 80,000 ft. The Blue Scout payload would continue into orbit, or into deep space, depending on its mission.

Part of the proposal is that during the powered portion of the X-15's flight the Blue Scout should be monitored by the missile test director in the B-52. When the director confirms that the missile is ready to fire, the X-15 pilot arms the booster ignition and "destruct" system circuits; when the proper altitude and velocity are reached, the vehicle would then be launched.

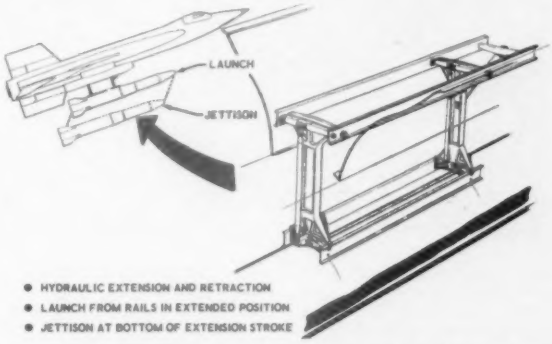
If a fault is discovered in any of the systems while the X-15 is still attached to the B-52, it is possible to return the entire payload to base. In the present research flights of the X-15, reliability of the launching system is said to have been extremely high.

In 69 missions in which the X-15 was carried by the B-52 there has not been a single failure attributable to the parent aircraft. Similarly, in 37 powered flights of the X-15 the engine has started reliably on each occasion, with test operations carried out according to schedule.

In the case of the proposed X-15/Blue Scout launchings, a failure in the launching aircraft would result in the jettisoning of the Blue Scout and the normal emergency recovery procedure for the X-15. In the interests of safety, to cater for non-ignition or jettisoning of the Blue Scout, launchings would be carried out in such a manner that the missile will impact in the ocean or on an Air Force bombing range. Command "destruct" receivers would be provided in the Blue Scout to enable the Range Safety Officer to destroy the missile in the event of erratic flight after leaving the X-15.

Advantages of Air Launching

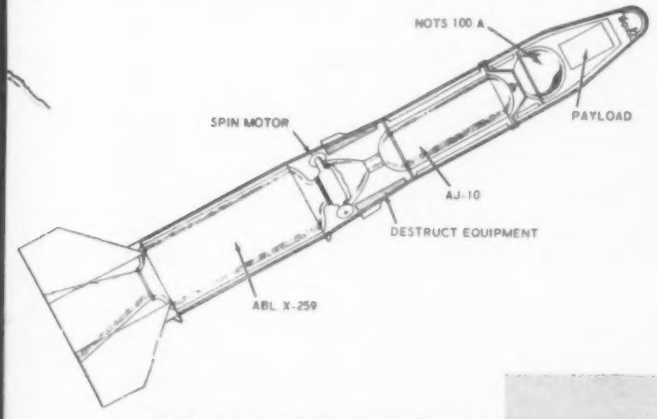
According to North American and Ford Aeronutronic, air launching of the Blue Scout with the existing B-52/X-15 combination would offer several advantages over the ground launching of a complete four-stage vehicle of this type, without compromising either the performance or the mission of the rocket.


LAUNCH
JETTISON
● HYDRAULIC EXTENSION AND RETRACTION
● LAUNCH FROM RAILS IN EXTENDED POSITION
● JETTISON AT BOTTOM OF EXTENSION STROKE

Launch and jettison mechanism for the X-15-carried Blue Scout consists of two arms, with guide links pivoted at the upper ends, and guide rails on the lower ends from which the rocket is launched. After Blue Scout leaves, the rails are retracted into the X-15 pylon.

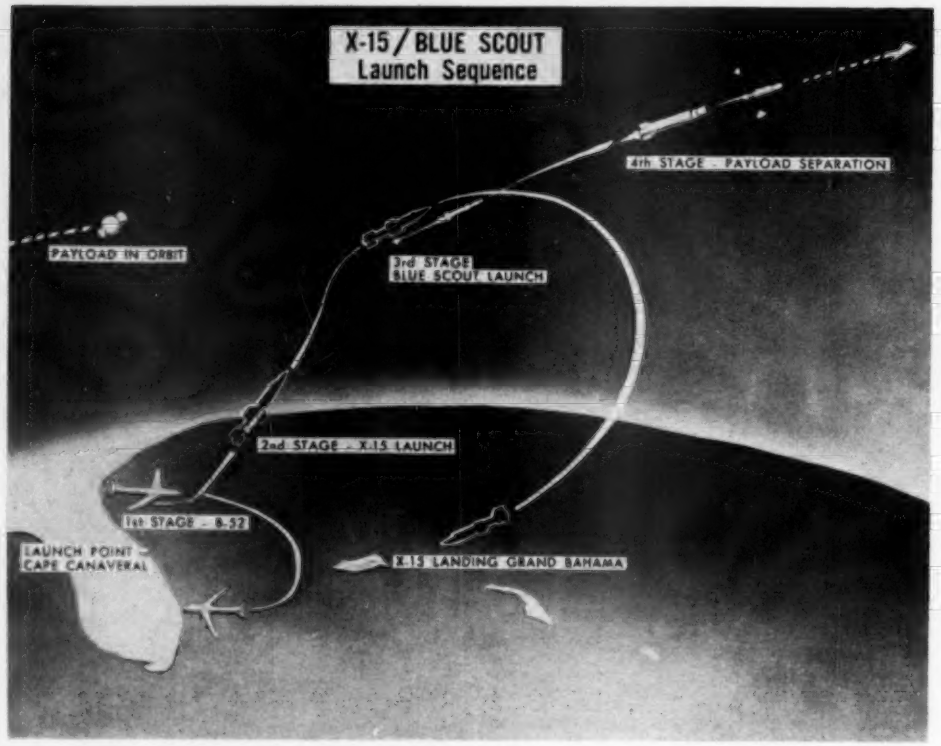
In addition to advancing knowledge and experience in the field of recoverable booster systems, the new concept extends the usefulness and capabilities of the Blue Scout vehicle and offers further significant cost savings in the already low-cost Blue Scout rocket programme. It has, in fact, been estimated that the proposed air-launching technique would offer a two-thirds cost reduction over present guided or orbital Blue Scout launchings, and that the cost of launching unguided or probe Blue Scouts would be halved.

The companies concerned have indicated that the X-15/Blue



This drawing shows the proposed two-stage Blue Scout rocket for launching from the X-15. It consists of the upper stages of the U.S.A.F. Blue Scout Junior, with a small spherical rocket for injecting the payload into orbit.

A "desert mirage" creates the illusion of water on the ground as an X-15 makes its approach to land on the dry lake bed of Edwards A.F.B., Calif. The "saw-tooth" pattern visible on the lower fuselage is due to frost formation caused by liquid oxygen within the aircraft.

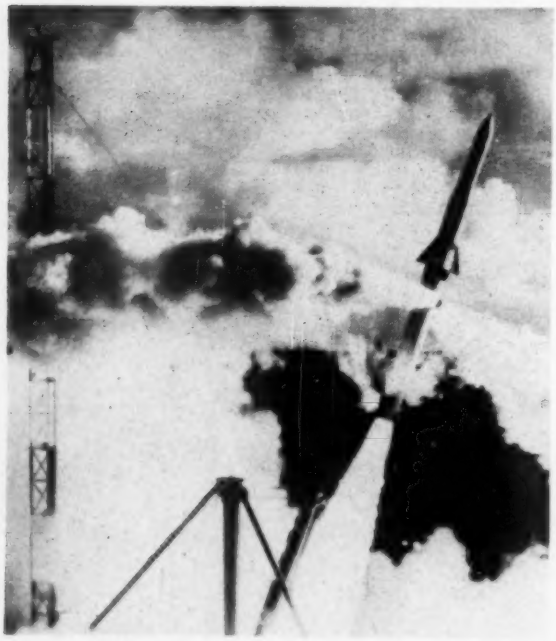


Launch sequence for the X-15/Blue Scout combination over the Atlantic Missile Range.

Scout combination could be ready to launch the first missile in nine months at a total cost of approximately $850,000. This would include B-52, X-15 and Blue Scout modifications, fabrication of two dummy Blue Scout test vehicles, and one actual Blue Scout flight vehicle, as well as development tests.

Subsequent launchings, including costs of the Blue Scout rocket and associated pre-flight test equipment, and operating costs of the B-52 and X-15, would be less than $250,000 per flight.

For the actual launching, it is proposed to use existing tracking stations at the Pacific Missile Range in southern California, or the Atlantic Missile Range in Florida.



This picture shows the launching of a complete four-stage U.S.A.F. Blue Scout from Cape Canaveral. In the air-launching technique the two initial stages would be replaced by the recoverable Boeing B-52 and the North American X-15.

Future Prospects

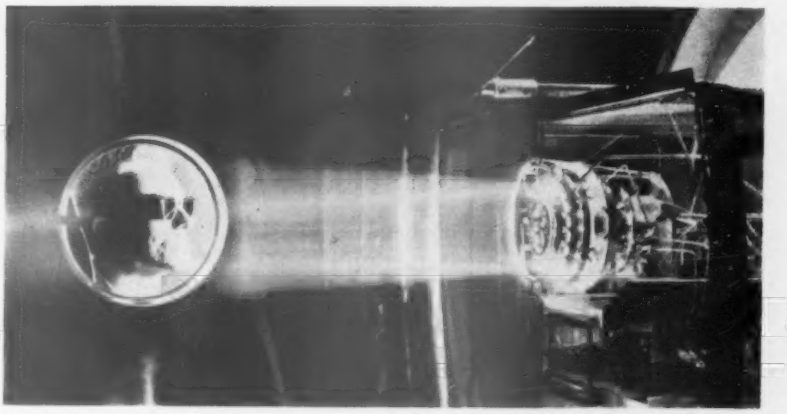
Needless to add, the merit of this particular arrangement is not so much in the economies it may effect in the existing Blue Scout programme, but in the promise it may offer for the development of more specialized manned booster systems, designed specifically for the task. There is obviously a long way to go before it is possible to contemplate the development and application of large winged booster systems which can be "flown back to base," but as major space launchings grow in number towards the end of the present decade, designers will certainly be looking more intently into the vexed problem of how to get the booster back to Earth in one re-usable piece.

Computer for Satellite Communications

FROM Elliott-Automation comes news that the Post Office has ordered a National-Elliott 803 Electronic Digital Computer for use at its satellite system radio station on the Lizard, Cornwall, in connection with transatlantic tests of communication satellites next year. The computer will be used to convert predicted orbital information derived from the U.S. Minitrack world-wide network of tracking stations into steering instructions on punched tape for controlling an 85-ft. diameter paraboloid steerable aerial at the Post Office radio station.

At the appropriate time, the steering instructions on the punched tape will be fed into the electronic controlling equipment of the aerial which will then be pointed in the direction of the satellite as it appears above the horizon. Throughout the course of the satellite, as it rises to its zenith and falls towards the horizon, the aerial will continue to be pointed automatically at the satellite, with a precision of the order of one-tenth of a degree.

The application is one which demands a high degree of reliability in the computing equipment, involving as it does long periods of continuous operation. In this connection, it is interesting to recall that a National-Elliott 803 computer exported to the United States was recently stated to have completed more than 4,000 hours of continuous operation.



An ion engine being developed by Hughes Aircraft Company in conjunction with NASA's Lewis Research Center. Although it produces a thrust of less than 1/10th lb., it is potentially capable of very long-period operation. The technician is observing the test through a porthole in the simulation chamber.

Preparing for Centaur

AS a preliminary to the launching early next year of the first Atlas-Centaur, NASA announced on Nov. 19 that the Pratt & Whitney RL-10 liquid-hydrogen/liquid-oxygen rocket engine has successfully completed its preliminary flight rating test. The engine was previously known as the XLR-115.

Two RL-10s will power the Centaur stage. Later, six of these engines will be clustered to drive the second (S-IV) stage of the Saturn vehicle.

The test, consisting of 20 captive firings, was completed in five days with the engine under simulated space conditions. Throughout the test the engine consistently produced its rated thrust of 15,000 lb. Post-firing inspection indicated that the engine remained in condition for continued testing.

Development of the RL-10 began in October, 1958. More than 700 firings, amounting to a total firing time exceeding 60,000 sec., were made during the development programme. The test rate has recently been raised to about 70 firings per month.

A total of 12 engines has so far been delivered by Pratt & Whitney to the High Thrust Test Area, Edwards, Calif., to the NASA Lewis Research Center, Ohio, and to General Dynamics/Astronautics and Douglas Aircraft Company for further testing prior to the launching of Centaur and Saturn vehicles from Cape Canaveral.

Successful completion of the initial static test programme marks a significant step in the U.S. space programme; use of liquid hydrogen as a fuel instead of the more conventional hydrocarbon fuels such as kerosene raises the performance about 30%. The problems associated with the application of this fuel can be judged from the fact that liquid hydrogen has a boiling point of −423° F. Despite all the difficulties, however, the RL-10 has been designed to provide for multiple "restarts" in space with coast periods of many hours between firings.

Echo Cash Award

MR. W. J. O'SULLIVAN, of the Langley Research Center in Virginia received an award amounting to $5,000 on Nov. 16, in recognition of his invention of the inflatable satellite. The invention has been employed in two successful NASA space experiments, Echo I and Explorer IX.

In presenting the award, Mr. James E. Webb, the NASA administrator, congratulated O'Sullivan for his "significant contribution to space science and technology in conceiving the inflatable space vehicle invention and in initiating and directing its successful development, in the face of many obstacles, into an extremely useful device for upper atmosphere space research and World-wide communication."

The idea is said to have been conceived by O'Sullivan in January, 1956, although it appears to have been first introduced as an idea in the paper, "Minimum Satellite Vehicles",* presented by K. W. Gatland, A. M. Kunesch and A. E. Dixon at the 2nd Congress of the International Astronautical Federation in London in 1951. The relevant section from their paper reads: "As the final step [of the satellite launching rocket] will be of particularly small dimensions (3 metres long × 0.5 metres dia.), it might be possible, for a very small weight penalty, to incorporate a metallized 'paper' balloon for use as a radio reflector, which could be attached to the rocket and inflated in space."

Nevertheless, O'Sullivan's proposal was accepted as an experiment for the International Geophysical Year. He further demonstrated that a very thin, aluminium-coated Mylar-plastic sphere, stressed lightly beyond its elastic limit during the inflation process, would retain its shape regardless of subsequent loss of internal pressure. Thus he proved this device could serve as a useful vehicle for space research.

On Aug. 15, 1961, U.S. Patent No. 2,996,212, entitled "Self-supporting Space Vehicle," was issued to the Administrator of NASA, on behalf of the United States, for the invention.

* Reproduced in "Realities of Space Travel," ed. L. J. Carter, Putnum, 1957.

Saturn Production

A PRODUCTION contract to build the first stage of the Saturn C-1 is being awarded to the Chrysler Corporation of Detroit, Michigan. It is proposed to construct the booster at the newly announced NASA Michoud Plant, some 15 miles north-east of New Orleans.

Under the contract, which is worth $200m., 20 S-1 boosters will be produced in a programme extending to the end of 1966. It is expected that the Aerojet-General Corporation will aid in the static testing and provide launch support facilities at Cape Canaveral.

Ten R. and D. prototypes of the S-1 stage are being built at NASA's Marshall Space Flight Center in Huntsville, Alabama, and this centre will direct the work at Michoud and elsewhere. This will include training of Chrysler personnel at Marshall's Fabrication and Assembly Division prior to the beginning of S-1 production at Michoud.

The advanced Saturn booster S-1B also will be built at the Michoud plant but by a different contractor. Five industrial proposals for this contract were received by NASA on Nov. 8 and are now under study.

The production centre itself—formerly the Michoud Ordnance Plant—is at present being "rehabilitated" for Saturn S-1 production. NASA is looking into proposals from no fewer than 35 companies to select a third contractor—a "housekeeping" firm—to maintain and service the plant.

First Saturn S-1 unit to be produced at Michoud is scheduled for shipment to Cape Canaveral in early 1964. A production rate of one booster per month is expected to be achieved as the programme reaches its climax. Some Chrysler personnel are being assigned to Marshall and Michoud in the next two months. By mid-1962, some 1,800 people should be employed at the plant under this contract and peak S-1 employment of about 2,400 should be attained during the first half of 1963.

Nuclear-electric Propulsion

WORK on electric propulsion systems in the United States, NASA announced on Nov. 20, is to be concentrated at the Lewis Research Center in Cleveland, Ohio. One of the key reasons for this decision is the need to use the maximum resources of the Marshall Space Flight Center—where valuable work on ion-drive rocket systems has formerly been carried out under Dr. Ernst Stuhlinger—on NASA's lunar and manned spaceflight programmes. Stuhlinger's group will now be employed exclusively on the latter projects.

The transfer will involve 48 industrial contractors at present engaged in Marshall's nuclear-electric programme. Their commitments range from study to hardware contracts for electric rocket engines and for the spacecraft which will test components of these engines in space.

This move, however, will not affect the RIFT (Reactor In Flight Test) programme, which will remain at the Marshall Space Flight Center. The RIFT project is concerned with the flight testing of thermodynamic nuclear rockets as upper stages of large chemical boosters.

The Fighting Services

New Australian D.C.A.S.

AIR COMMODORE C. T. HANNAH, C.B., C.B.E., R.A.A.F., has been appointed Deputy Chief of the Australian Air Staff. He will succeed Air Vice-Marshal I. D. McLachlan, C.B.E., D.F.C., R.A.A.F., who is to become head of the Australian Joint Services Staff in Washington in January, 1962.

At present Director-General of Plans and Policy in the R.A.A.F., Air Cdre. Hannah was previously Senior Air Staff Officer with the Far East Air Force in Singapore.

Fighter Command Aerobatics

AN end of season round-up of displays given by the "Blue Diamonds" of No. 92 Squadron (Sqn. Ldr. B. P. W. Mercer, A.F.C.) adds up to 43 shows in six countries, plus four to 10 rehearsals for each display.

The team's first show was given, with nine aircraft, for the A.O.C.-in-C., Near East Air Force, during an operational detachment to Cyprus early this year. Several more displays were given over the island before the Squadron returned to Middleton St. George, then its home base. Since the end of May the blue Hunter F.6s of No. 92 Squadron have been operating from Leconfield.

On April 24 the team gave its first display in Europe—at Wildenrath for the West German Air Force open day. A fortnight later No. 92 went through its paces at Bergen for the Norwegian Aero Club's display. By June No. 92 was flying 12 aircraft and for the S.B.A.C. show at Farnborough, in September, it put up 16 Hunters. New formations introduced by the Blue Diamonds include the "T-bone," with nine aircraft, and the 16-aircraft "Diamond-T."

For the Battle of Britain "at home" day the Squadron put on displays at three different stations, and then on Sept. 24 performed before its largest audience ever—650,000 spectators at Furstenfeldbruck, Germany. A second Middle East tour for the Squadron was arranged in October, when displays were put on at Tehran and Athens.

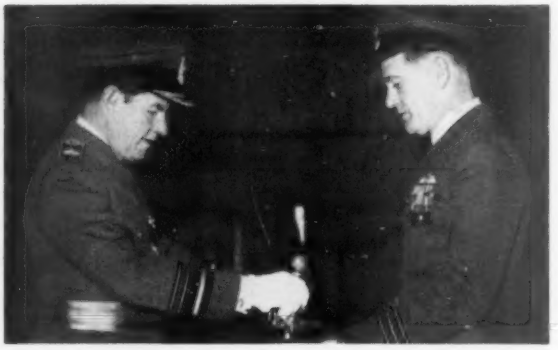
On four occasions the weather permitted only the "flat pattern"—tight twins and rolls—to be performed, but of all the shows planned, only one had to be abandoned completely through bad weather.

Air Rank Appointments

AIR COMMODORE S. W. R. HUGHES, C.B.E., A.F.C., is to become A.O.C., No. 19 Group, Coastal Command, in February of next year, with the acting rank of Air Vice-Marshal.

Transferring from the R.N.Z.A.F. to the R.A.F. in 1938, Air Cdre. Hughes served at the United States All-Weather Flying Centre in Ohio in 1947. After Air Ministry duties as an Assistant Director of Training and as a Deputy Director of Operational Requirements he commanded R.A.F. Farnborough, took the 1955 Imperial Defence College course, and commanded R.A.F. Jever, Germany. He was appointed to his present post as Air Member of the Defence Research Policy Staff in November, 1958.

The Director of Air Staff briefings at the Air Ministry, Air Cdre. P. H. Cribb, C.B.E., D.S.O., D.F.C., has been appointed Senior Air Staff Officer, Air Forces Middle East, with effect from Dec. 8. In recent years he has served on Air Staff duties with Coastal and Bomber Commands, commanded R.A.F. stations Oldenburg, Ahlhorn and Gutersloh in Germany, and taken the 1951 course at the R.A.F. Staff College.



TROPHY PRESENTATION.—The C.-in-C., R.A.F. Germany, Air Marshal Sir John Grandy, recently presented the Sassoon Trophy to No. 17 Canberra Squadron. He is seen here handing over the 2nd. A.T.A.F. photographic reconnaissance award to the C.O., Wg. Cdr. D. G. Walker, at the presentation parade.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. J. R. Ramsden, A.F.C., to the Department of the Chief of Air Staff; Wg. Cdr. L. Penny to the Department of the Air Member for Supply and Organization.

Bomber Command: Wg. Cdr. J. H. S. Broughton, D.F.C., A.F.C., to R.A.F. Honington to command the Administrative Wing.

Fighter Command: Gp. Capt. G. H. Westlake, D.S.O., D.F.C., to R.A.F. Buchan to command.

Coastal Command: Gp. Capt. F. D. Campbell, L.R.C.P., L.R.C.S., L.R.F.P.S., to Headquarters No. 18 Group as Senior Medical Officer.

Flying Training Command: Wg. Cdr. B. Brown to Headquarters for engineering staff duties.

Technical Training Command: Wg. Cdr. B. L. Duckenfield, A.F.C., to R.A.F. West Drayton to command; Sqn. Ldr. A. L. Sharp to the R.A.F. Technical College, Henlow, as accountant officer, with acting rank of Wg. Cdr.

R.A.F. Germany: Gp. Capt. S. G. Taylor as Command Engineering Officer; Gp. Capt. D. C. Light, M.R.C.S., L.R.C.P., D.M.R.D., to the R.A.F. Hospital, Wegberg, as radiologist.

Near East Air Force: Gp. Capt. H. B. Verity, D.S.O., D.F.C., to R.A.F. Akrotiri to command.

Air Forces Middle East: Wg. Cdr. J. T. Lawrence, O.B.E., A.F.C., to Headquarters for Air Staff duties; Wg. Cdr. K. R. Manns as Command Catering Officer.

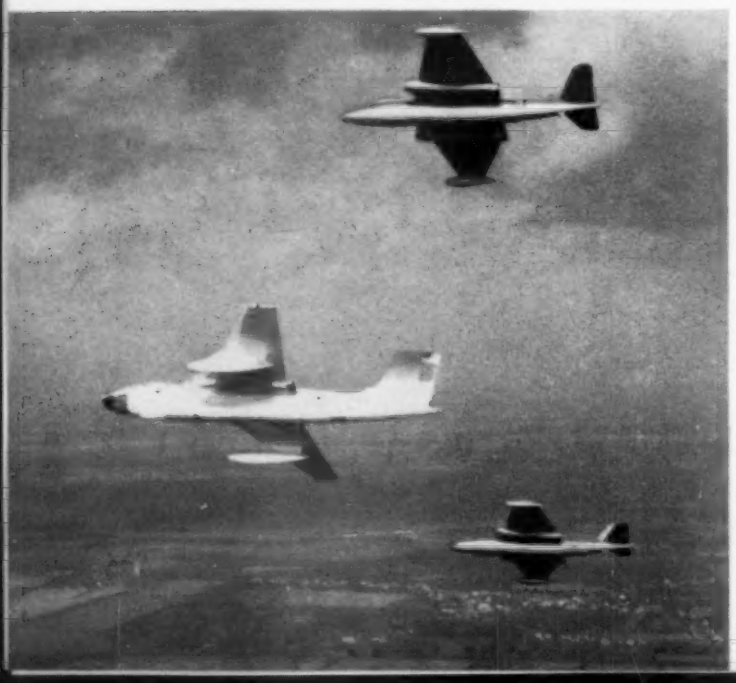
Other Appointments: Wg. Cdr. H. J. Cobb, D.S.O., D.F.C., A.F.C., to the R.A.E., Farnborough, for special duties.

More Service News

CF-104 Conversion.—The first CF-104 Starfighters to be introduced into service with the R.C.A.F. have arrived at Cold Lake. The aircraft, CF-104D trainers, have been issued to No. 6 Strike Reconnaissance Operational Training Unit, which is responsible for training Canadian pilots on the new fighter.

R.A.F. Hawkinge.—R.A.F. Hawkinge is to close on Dec. 8. The W.R.A.F. Officer Cadet School is moving to Jurby, Isle of Man; No. 1 Gliding Centre is going to Swanton Morley; and courses for airwomen formerly held at Hawkinge are being transferred to other training stations.

Helicopter Rescues.—A floating stretcher for use in helicopter rescue work has been developed by Sqn. Ldr. J. Price, who recently relinquished the command of No. 103 Squadron and is now at Headquarters, Transport Command. Designed to provide maximum protection to the patient, the stretcher incorporates plastic flotation packs at its head, a high rail for protection from knocks against rocks or trees, and adjustable quick-release strapping. It has a total unloaded weight of 60 lb. and can be carried inside either a Sycamore or a Whirlwind.



P.R. TYPES.—A Valiant B(PR).1 of No. 543 Squadron in formation with a Canberra PR.9 (top) and a PR.7 of No. 58 Squadron near their base at R.A.F. Wyton. Both squadrons form part of the United Kingdom Reconnaissance Force.

Dining with the R.A.F. Reserves Club

ANNUAL DINNERS of the R.A.F. Reserves Club tend to assume more distinction and importance with each succeeding year. On Nov. 20, at Quaglino's Restaurant in St. James's, this year's occasion was graced by the presence of H.R.H. The Duke of Gloucester, Patron of the Club, of whose members more than 300, with their guests, were assembled.

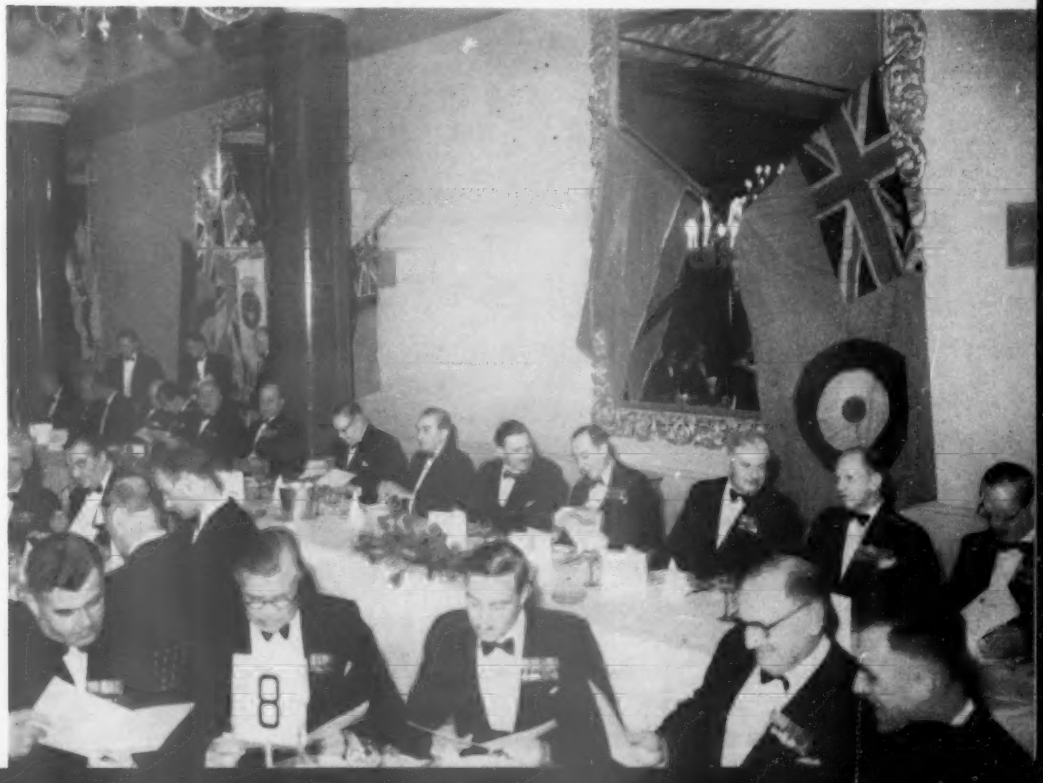
At the top table were names famous in Government, the Services and industry. They included Air Chief Marshal Sir Thomas G. Pike, Chief of the Air Staff; the Rt. Hon. Harold Watkinson, Minister of Defence; the Rt. Hon. Julian Amery, Secretary of State for Air; and Major-General J. H. Ives, Commander of the 3rd United States Air Force. The giants of industry were represented by Sir Roy Dobson, Lord Portal and Sir Frederick Handley Page, while a host of personalities eminent in a generation of aviation were present in the assembled company.

After the Club's president, Sir Miles Thomas, had proposed the loyal toasts, SIR THOMAS PIKE, the C.A.S., proposed the toast to the R.A.F. Reserves Club. He spoke at some length on the past and future of the R.A.F. from the Gloster Grebe with its Mach 0.15 speed to the Blue Steel and Skybolt era ahead—with, he stressed, a manned aircraft force behind it: fighter, bomber and transport aircraft, VTOL and supersonic. He spoke of certain types of ill-informed Press reports concerning the R.A.F.'s future and the damaging effect it had on the Service being able to recruit the right sort of youth. All the sound information was to be found in the White Papers on the subject "but unfortunately," said Sir Thomas, "the boys we want rarely read White Papers!"

H.R.H. The Duke of Gloucester, Patron of the R.A.F. Reserves Club, with Sir Miles Thomas, president.

MR. HAROLD WATKINSON spoke of the World-wide commitments we had and, being World policemen, how little money there was to spare for so many of the projects we would like to encourage. Nevertheless, he said, Bomber Command still had it within its power to strike at an enemy decisively and to devastate his war potential in one night. He pointed out the good influence an organization such as the R.A.F. Reserves Club with its members all concerned with the Services or aviation could have in keeping alive the interest of the younger generation in aviation.

LORD PORTAL, as chairman of the British Aircraft Corporation, had much to say which must have caused some deep thinking by the Ministers present. He decried the Government's policy of encouraging the aircraft industry to merge into fewer and bigger units and then having done so depriving them of any worth-while orders to keep things going. Lord Portal referred to the resurgence of the French industry with a very full governmental backing; and going abroad again he mentioned the recent orders received by the American industry for 600 Boeing 707s and our own order to his organization for five VC10s for Transport Command.—C. A. SIMS.



The right and left hand sections of the top table, seated at which many eminent representatives of the Services and aircraft industry can be recognized.

Navigating the Supersonic Transport

EARLIER this year the American Institute of Navigation held a three-day symposium on supersonic transport operations. Attended by representatives from NASA, the F.A.A., the U.S.A.F.'s B-58 organization at Fort Worth, eight major international airlines, seven airframe manufacturers and 17 electronic companies, this meeting progressed along three lines of development. The commercial carrier's requirements; the military operator's experience with supersonic flight problems; and the navigation system manufacturer's recommendations regarding equipment now available or on the near horizon.

Civil Navigation Requirements

Mr. J. R. Whitlock, manager, systems evaluation and development, American Airlines, stated a strong interest in an inertial navigator with Loran-C and VOR type supplementary equipment for American domestic routes and the addition of astrotracker imputs for over-water navigation. He expressed concern for the cockpit display, noting space limitations and the occasional need for modifying the flight plan in the air. He pointed out the need for serious study of improved altimetry and of the accuracy required of air-data systems.

A practising navigator with T.W.A., Mr. J. Larsen foresaw the need for increased accuracy and reliability of navigation-system operation as a function of traffic density. He called for heading intelligence derived from a stable free gyro with a drift rate no greater than $\frac{1}{4}°$ per hour (which would result in an off-course error of 15 m.p.h. in a Mach 3 vehicle assuming that no compensation were made); improved charts which would be essentially (individually constructed) oblique Mercators for each route, thus eliminating convergence error; astro heading checks to an accuracy of 0.1° with a position-fixing capability as well; and continuing support from electronic aids such as Loran, VOR, Consol, ADF, Decca and Dectra.

An inertial platform should be included with an accuracy of three miles in the first hour of operation and possessing reset capability. The Doppler radar should have an accuracy of 0.3% (which would be an accuracy of ±5.4 n. miles on a 1,800 n. mile leg). An absolute altimeter should be included, along with a companion pressure altimeter accurate to 0.1%. Variation at cruise altitude should be no greater than ±50 ft.; air-temperature indication should be accurate to 2° C.; airspeed indication should be accurate to 0.5% (this would be ±8.5 knots of T.A.S. and/or 2.5 knots of I.A.S. at Mach 3 and 70,000 ft.).

M. J. Hardouin, chief navigator of Air France, was most forceful in his request for reliability. Given a choice between a system which is accurate to 1/1000 and 85% reliable, and a system accurate to 1/10 but 99.9% reliable, he would always select the latter. He pointed out a criticism voiced by many practising navigators—that sophisticated electronic equipment does not, when it fails, warn of its failure, and this creates serious navigational difficulty. M. Hardouin also suggested the employment of Doppler radar and astrotracker, and demanded heading variations no greater than ±1° with better than 99.9% reliability.

U.S.A.F. B-58 Experience

The navigation system of the B-58 cost approximately $1.1 million and this figure does not include ground-support equipment. The system consists of some 14 different units with a total weight of 1,700 lb. and occupying about 160 cu. ft.—a good share of this weight and displacement being attributable to the bombing system. It is a Doppler-inertial-astro system possessing Great Circle and rhumb-line steering capability, mapping radar, in-flight printer, malfunction detection and replacement circuitry and two stable platforms. Pure inertial-mode operation is considered to be limited to 10-min. periods after which gyro drift rates may be unacceptable. Doppler operation is the key to accurate navigation and provides the major velocity source to the navigation unit.

An interesting lesson comes from U.S.A.F. experience with the B-58 navigation simulator. The production of a piece of equipment which will satisfactorily duplicate the operation of the navigation system has required a full three years. A commercial carrier planning the use of a similar training device should be aware that the lead time on similar trainers is almost as long as is the development time for the aircraft navigation system itself—at least if the simulator is to be a faithful copy.

The average U.S.A.F. navigator flying as a crew member in the B-58 has more than 4,000 hrs. of experience in piston and jet aircraft when he starts training. His education includes three years of college, plus two years of Air Force navigation and electronic schooling. The B-58 programme consists of six weeks of intensive academic training in a special school geared to teach systems theory. Following this training he joins the Combat Crew Training School at Fort Worth for a four-week period of ground school, followed by eight weeks of combined systems flight and simulator training.

The 10 weeks of academic training cost the U.S.A.F. $5,000. Flying training is estimated at $2,000 per flight hour. It should be remembered that the B-58 navigator has transitioned through jet aircraft and thus needs a minimum of schooling in the subjects of meteorology, electronics, and high-speed aircraft navigation procedures. This intermediate level of schooling cost $21,000, plus whatever value you place on past experience.

Electronic Manufacturers' Recommendations

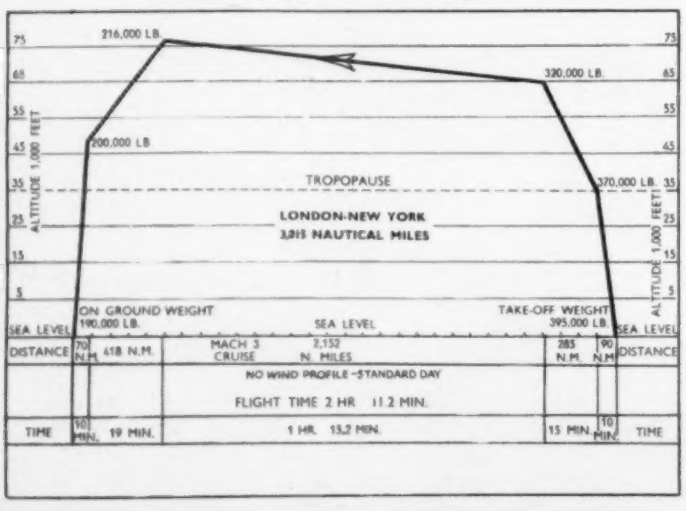
A paper by the Sperry Gyroscope Co. dealt with philosophical objectives of a transport navigation system and its relationship to the economics of buying expensive equipment. Mr. Bellantoni, of Sperry, spelled out the concept of utilizing a factor of seven times the navigation-system accuracy as the interval between parallel tracks. He gave an example of an integrated system which embodied a long-range fixing aid, such as a Loran receiver, capable of automatically tracking both Loran-A and -C stations, backed up by a Doppler radar and a gyroscope heading reference.

The capabilities of astrotrackers was presented by Mr. E. Tecklenburg, of Kollsman. He suggested an integrated system made up of Doppler-inertial-astro components possessing high reliability at a total cost of approximately $100,000. The Kollsman proposal envisaged a daylight tracker (approximately 21 bodies are available to an observer in the northern hemisphere) which would supply heading accuracies of 0.1° and be capable of developing celestial positioning data. As a back-up he would use magnetic heading, true airspeed and a vertical gyro.

One of the prime sources of intelligence to the navigator is the central air-data system. The Bendix Eclipse-Pioneer Division indicated that it was possible to provide the navigator with values of T.A.S. accurate to ±5 knots, I.A.S. accurate to ±3 knots, altitude indications accurate to ±600 ft. (static pressure to ±0.14 p.s.i.), Mach number accurate to ±0.013—or 1% at the inlet and .006 to .015 in the cockpit.

Mr. J. Crenshaw, of IBM, presented a paper which had as its basis the concepts employed in design of the B-70 navigation system which makes maximum use of a central computer with stored data, called-out automatically, fed by a Doppler-inertial-astro integrated mixture of information, and used as determined by a "voting" circuit. The astro data would provide limited-error navigation data to the computer, so that the inertial system could not exceed some reasonable drift limit.

The General Precision paper advocated the use of either a Doppler-inertial-gyro compass system or, if the additional money were available, a Doppler-inertial-astro system. Accuracy would be approximately 4.1 n. miles across-track per 1,000 miles flown and 1.7 n. miles along-track per 1,000 miles flown.



A typical flight profile for a proposed American Mach 3 transport with a supersonic cruise range of about 3,000 n. miles. This type of aircraft would have a maximum gross weight of 450,000 lb., a maximum cruise altitude of 80,000 ft. and accelerate to supersonic speed at between 36-46,000 ft.

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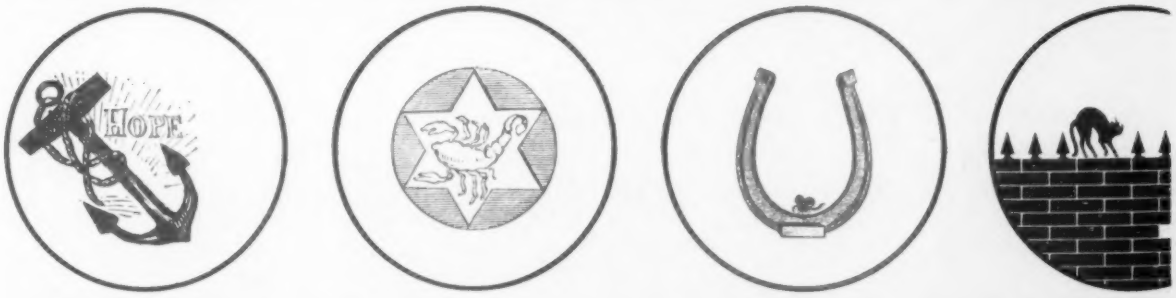

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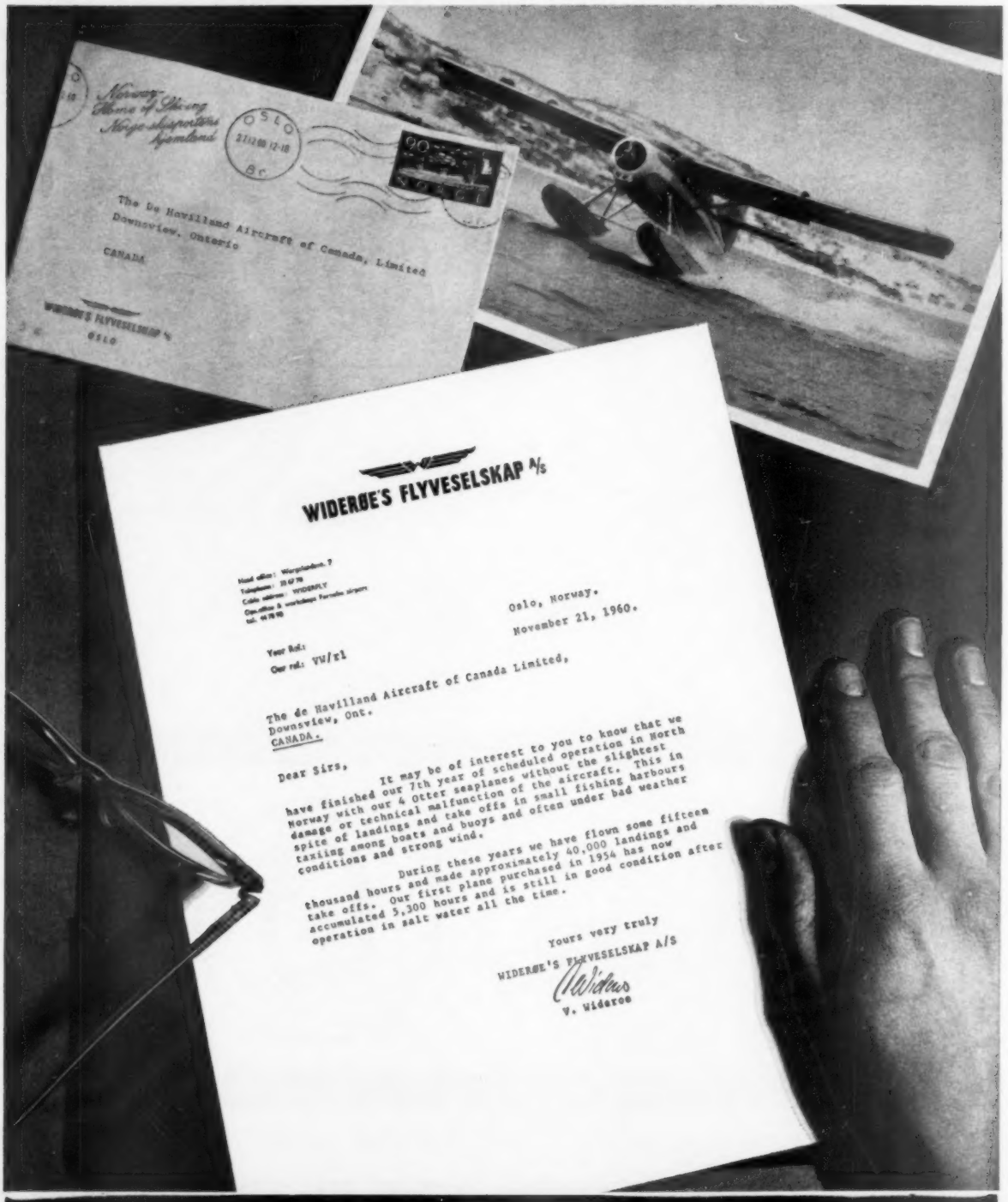
OSLO
The De Havilland Aircraft of Canada, Limited
Downsview, Ontario
CANADA
WIDERØE'S FLYVESELSKAP A/S
Oslo, Norway.
November 21, 1960.
Your Ref:
Our ref: VW/rl
The de Havilland Aircraft of Canada Limited,
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CANADA.
Dear Sirs,
It may be of interest to you to know that we have finished our 7th year of scheduled operation in North Norway with our 4 Otter seaplanes without the slightest damage or technical malfunction of the aircraft. This in spite of landings and take offs in small fishing harbours taxiing among boats and buoys and often under bad weather conditions and strong wind.
During these years we have flown some fifteen thousand hours and made approximately 40,000 landings and take offs. Our first plane purchased in 1954 has now accumulated 5,300 hours and is still in good condition after operation in salt water all the time.
Yours very truly
WIDERØE'S FLYVESELSKAP A/S
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Pioneer's Life Story

SKY FEVER*, the autobiography of Sir Geoffrey de Havilland, is a most revealing story, for it describes what went on in "D.H.'s" mind when facing big decisions. All through his life he has done things himself, testing all his aircraft up to the D.H. 94 in 1937. Now he has written his autobiography with only the assistance of his secretary.

On the very first page I'm sure there is an anachronism. When testing his first aeroplane in 1909 he said to Hearle, "I'll taxi some way up the hill . . . ." It is possible that D.H. invented the verb "to taxi" that early on but improbable; surely it was invented by the Brooklands pilots in 1911.

The book is sheer joy to read especially his descriptions of that far-sighted man, Jason Saunders, his maternal grandfather, who gave his grandson £1,000 in 1908 to experiment in flying when no one had yet flown in England and only Wilbur and Orville Wright had really flown.

D.H. had an elder brother, Ivon, who had already begun to make his name in motorcar designing when he died prematurely at an early age. It is an interesting speculation what might have happened if Ivon had lived and joined forces with Geoffrey in aviation.

This book duplicates very little of the firm's history already told so ably in Martin Sharp's book "D.H." It is a personal story and there are lovely glimpses of the official Air Ministry minds. For example when D.H. and C. C. Walker went to the Air Ministry in 1937 to put proposals for an aeroplane that became the Mosquito:—

> "We outlined our scheme and showed our drawings which were barely glanced at. Then the bolder of the two officials, addressing us like a schoolmaster and waving a hand towards our cherished plans, said, 'Forget it. You people haven't produced a war machine for years and if you want to do so now you must start on something simple—perhaps design a wing for an experimental plane. We've got one coming along now and you may be able to help us. It's called the *Ape*.'
>
> "I looked at him half in anger and half in resigned despair and nearly said, 'Why design another?'"

And when applying to the Air Ministry (before the A.R.B. was born) for a C. of A. for the D.H. 51 there was an almost unbelievable example of red tape and stupidity. The engine had single ignition, but dual ignition had become general, so was fitted to the powerplant of the 51. But the Air Ministry at once said, "But the engine was passed out with single ignition and though it is probably safer with dual ignition you cannot fly it, and you will be breaking the law if you do." D.H. explains that was 36 years ago; and the modern brood of officials are much more helpful as witness the Comet I inquiry.

When D.H. was engaged in 1910 as aeroplane pilot and designer to the Balloon Factory at Farnborough, the balloonatics there watched his strenuous efforts to unload and erect his aeroplane in dour silence and made no move to assist. The airship people had cause for anxiety in the imminent obsolescence of their craft!

He gives a wonderful description of his first flight over a fog from which he was lucky to land safely. And he has interesting observations on Lindemann's alleged work on spinning. Though Lindemann was credited with a remarkable memory, he said at a later date in his memoirs that his deep modesty prevented him from mentioning his spinning tests. That deep modesty, comments D.H., prevented him communicating his discoveries to save the lives of young pilots from fatal errors.

He has amusing and complimentary things to say of all his associates. Of C. C. Walker he says one of his most endearing habits is to accentuate what is good in a person and belittle his faults. . . . "He can even point out the totally hidden virtues of English weather."

There is a most revealing paragraph on what makes a successful designer tick, on p. 146.

He tells how his eldest son Geoffrey flew in D.H.'s first aeroplane in his wife's arms when a few months old. And his anguish when first his son John and then Geoffrey were killed flying. The premature death of his first wife, Louie, was, says D.H., due to the tragic loss of her sons as much as to physical causes. The story ends on a happy note when he meets the lady who was to become his second wife in Africa to bring happiness to him again.

I said at the beginning of this review that D.H. wrote this book himself. That is not strictly accurate. The final chapter is on space travel, and D.H. says that as his knowledge of space travel is rudimentary he arranged for Mr. Geoffrey Pardoe, one of his space travel specialists, to give his views, which he does right well.

What delighted me most in the book was D.H.'s confession that he knows nothing about business, and when his financial wizards produce graphs and diagrams, showing how business is improving or deteriorating, they mean almost nothing to him. I know just what he means. I'm glad to find I am in such good company now. GEOFFREY DORMAN.

* Sky Fever, the autobiography of Sir Geoffrey de Havilland, C.B.E., 240 pp.: 5½ in. by 8¾ in. Illustrated. Hamish Hamilton, 25s.

Arthur J. Hughes, O.B.E.

ARTHUR HUGHES died on Nov. 4 at the age of 81. He was like Prince Henry the Navigator in that he had an enormous enthusiasm for navigators and anything to do with navigation, though he himself never practised it. He began his career in the old family navigation shop of Henry Hughes and Son in Fenchurch Street, and later moved to their instrument factory at Barkingside where he worked hard for nearly 60 years to advance the art and science of the navigator. He met nearly every famous navigator, both marine and air, from 1920 onwards and had a fascinating fund of stories about them.

He was an idealist and pressed on with any new instrument if he was convinced it was right, regardless of the cost. He had failures but also great successes.

For instance, in 1915 he realized that the marine compass with its heavy card could never be made to work in the aeroplane then developing with its new accelerations and northerly turning error unknown to the ship's compass maker. He sponsored the commercial development of the aperiodic compass with thin-wire filaments, which could move through the compass liquid with little resistance, and he kept behind it until it was used in every aeroplane.

He used to tell of the strange errors in early models of this compass, which could not be traced until Elsie, his wife, suggested investigating the steel "bones" in the stays (or were they corsets?) worn by the factory girls. They were found to be highly magnetized.

With all his enthusiastic energy he backed the development of the averaging bubble sextant before the 1939 War. It was a great success and by the end of the War, 250,000 bubble sextants had been produced by various firms for the Air Forces.

With his enthusiasm, unbounded generosity and fiery prejudices, he was a very lovable personality who will be greatly missed by everyone in the navigation world who knew him.

He leaves a widow, two sons and a daughter. The younger son, Gordon, had a distinguished career in the War as a pilot of the Photographic Reconnaissance Unit, making many long solo flights over Central Europe, for which he was awarded two D.S.O.s and a D.F.C.—FRANCIS CHICHESTER.

Publications Received

The Wright Brothers, by Geoffrey Norris. An account for younger readers of the lives and achievements of Orville and Wilbur Wright, with glimpses of other pioneers in the background. 160 pp. 5 in. by 8 in., illustrated with line drawings. Burke Publishing Co., Ltd., 10s. 6d.

Aeromodeller Annual 1961/62. Compiled and edited by D. J. Laidlaw-Dickson and C. S. Rushbrooke. Primarily of interest to the flying enthusiast, also contains some material for the solid scale modeller. 160 pp. 5¼ in. by 8¼ in., liberally illustrated. Model Aeronautical Press, Ltd., 10s. 6d.

Notes on Running an Operational R.A.F. Station, by Gp. Capt. K. R. C. Slater. Of interest primarily to serving officers in staff or command appointments, this little book is based on the author's practical experience of leadership, organization and administration. 104 pp. 5 in. by 7 in. Gale and Polden, 15s.

Turbulence, by Christopher Hodder-Williams. Readers who have read and remember this author's "Final Approach" will need no recommendation to this novel, despite its unfortunate description on the dust jacket as being "as up to date as next week's air crash." The story of a new airliner with a design fault. 288 pp. 5 in. by 7½ in. Hodder and Stoughton, 16s.

American Combat Planes, by Ray Wagner. This well-produced yet modestly priced volume is a record of all the fighters and bombers produced in the U.S. since 1917, whether they reached production or remained experimental prototypes, and whether used by the U.S. military and naval services, or only by foreign powers. Supporting the detailed narrative account of fighter and bomber development are photographs of each type and variant, with a condensed specification accompanying each picture. 448 pp. 8 in. by 11 in., illustrated. Macdonald and Co. (Publishers), Ltd., £2 10s.

Shell and B.P. Aviation Services at L.A.P.

MORE movements than ever at London (Heathrow) Airport during the summer months have resulted in record business for the oil companies which provide aircraft fuelling services there. Shell and B.P. Aviation Services, for example, sold no less than 10 million gallons during August. Compare this with the yearly figure of 4 million dispensed in 1949 and one can gain some idea of the demand for service which it is now called upon to satisfy.

A breakdown of the August total reveals that turbine fuel (Avtur and JP4) accounted for 9,300,000 gal., and aviation gasoline the remaining 700,000. The first-mentioned total is not surprising in the light of the fact that an aircraft of Boeing 707/DC-8 size can have the prodigious tank capacity of more than 19,000 gal.

The highest daily total achieved during August by this company was close on 400,000 gal., of which 343,000 was turbine fuel. The daily average for the month, recognized as the year's peak, works out at about 350,000 gal. Between 1,200 and 1,300 fuellings were made each week. Winter schedules are now in operation and the daily average has dropped to 250,000 gal.

Although Shell-Mex and B.P., Ltd., and its associated companies, distribute petroleum products in the British Isles for Shell International Petroleum and British Petroleum, airline fuelling contracts for service on a World-wide basis are placed with the parent companies. For example, in the case of B.O.A.C., whose contract is probably the most highly prized in the World, this is currently held by Shell; and, therefore, at British airports, where Shell-Mex and B.P. as distributors provide a fuelling service, this company's vehicles fuel B.O.A.C. aircraft. Abroad, however, the two companies operate their own services (British Petroleum as Air BP) and B.O.A.C.'s fuelling is therefore done by the Shell company.

Many of the airlines using Heathrow tend to split their business. B.E.A., for example, has currently divided its requirements on a 60%-40% basis between B.P. and Esso. Majority of the U.S. airlines tend to use Esso, stemming probably from this company's American parentage.

Three depots are maintained within the airport by Shell-Mex and B.P. These give a total storage capacity of 2½ million gallons. Until last year, when a pipeline to the airport from Walton-on-Thames was opened, all fuel had to be brought to the airport from the refineries by road. This was the daily task of about 40-60 tankers—the number being dependent on the requirements of the particular time of the year. Nowadays the fuel leaves the Grain refinery by pipeline for Walton from where it is pumped through 6½ miles of twin pipeline to the airport perimeter.

This pipeline enters at the southern corner and continues underground for a further 2¾ miles to the Perry Oaks depot on the west side where 15 tanks provide storage for 1,600,000 gal. A spur line from the southern corner carries fuel to the maintenance area depot situated close to B.O.A.C.'s maintenance base. The third depot, that in the central area from which all the needs of this part of the airport are dealt with, is supplied with fuel at a rate of 20,000 gal. per hr. from Perry Oaks by segregated pipelines which pass under runways 6 and 7. The maintenance depot area looks after the needs of the North side of the airport and also the hangar areas.

The pipeline from Walton through which fuel passes at 30,000 gal. per hr. is normally open for 10 hrs. per day and is used for the two grades of turbine fuel only. Standard aviation gasoline, both the 100/130 and 115/145 varieties, is still brought to the airport by surface transport.

Fuelling of a B.O.A.C. Boeing 707 completed, the crew of a Super Fueller contacts H.Q. by radio to be told about their next task.

Forty-six tankers are currently in use on the airport. These range from the new 10,000-gal. Severn Super Fuellers to five Tynes of 4,000-gal. capacity, first introduced in 1947 and still giving sterling service. Twelve tankers of the Dorset type, specifically designed for use with the first Comets in 1952, are also still utilized. Vehicle depreciation can be seen, therefore, to be very low.

All the tankers are fitted with two-way VHF radio. With this facility it is possible to maintain a mobile and flexible service since after fuelling an aircraft a vehicle can immediately be assigned to another task via the radio link with its H.Q. doing away with the need to return to its depot for fresh instructions.

In addition to the 46 tankers Shell-Mex and B.P. also has six de-fuellers and a fleet of smaller vehicles which dispense water methanol, alcohols and lubricants; these number 11. With the advent of turbine-powered transports which use very small amounts of oil these vehicles have a comparatively quiet life compared with their larger counterparts. Whereas a piston-engined type such as a DC-7C took on 120 gal. of oil at a time, the requirements of the jet-engined types are measured by the pint.

Looking at the future Mr. James Grant, the company's manager at Heathrow, is of the opinion that his operations set-up is more than adequate to meet the demands that will be placed upon it during the next 10 years. By this time it is almost a certainty that part of the dispersal areas at least will have a hydrant fuelling system in operation.

Left, a Super Fueller prepares to take on 10,000 gallons from the loading gantry in the central area.

(*Continued from page 691*)

U.K.-PHILIPPINES AGREEMENT.—The current and future pattern of air services operated under the U.K./Philippines Air Services Agreement of 1955 were discussed in London earlier this month by delegations representing the two governments. A statement from the Ministry of Aviation speaks of satisfactory arrangements having been agreed; no details were available at the time of going to press.

CYPRUS-LEBANON TALKS.—Talks between Cypriot and Lebanese civil aviation authorities have been suspended as no agreement could be reached, particularly over fifth freedom rights for Cyprus Airways between Beirut and the Gulf area. A stiffening in the Lebanese attitude has become apparent since M.E.A. became independent.

CANADIAN 'COPTERS. — Pegasus Airlifts of Toronto has been awarded an Air Transport Board licence to operate regular helicopter flights between Toronto International Airport at Malton and downtown Toronto, starting on Jan. 1. Pegasus plans 12 trips a day at a fare of $8.

YEMEN AIRLINES.—The two DC-3s which have been operated as a private royal airline for the Imam of Yemen have been purchased from the Yemeni Government by a new private company. Operations will continue under the name Yemen Airlines and the Government will undertake maintenance of the aircraft until new arrangements can be made. The new company is exempted from all taxes for four years. Services to Aden, Asmara and Jeddah are planned, as well as domestic flights.

DE-CERTIFICATED.—Far West Airlines and Travis Transportation of San Francisco have both had their operating certificates revoked by the F.A.A.

SYRIAN BOARD.—The board of the newly formed Syrian Arab Airways (see our issue for Nov. 9) comprises Gen. Tewfic Krawi (chairman), Youmni Demloge (D.G. of Civil Aviation), Gen. Naim Wafai, Abdul Jawad Sarmini and Zuheir Aita. Gen. Krawi has reported that flights to Iraq, Iran and Jordan (Jerusalem and Amman) will begin soon, and that the purchase of jet aircraft is being considered.

PAKISTAN HELICOPTERS?—A survey into the feasibility of helicopter services in East Pakistan is to be made for Pakistan International Airlines. A team of three from New York Airways, including Mr. John E. Gallagher, vice-president, will spend four weeks in Pakistan to plan heliport sites and en route and approach patterns, and to prepare dummy flight schedules, payload and performance data and operational costings.

K.L.M. LOSS.—In the first nine months of this year K.L.M. suffered a net loss of about £1,100,000 compared with a profit of £300,000 in the same period of 1960. Reduced traffic on the Atlantic was a major factor and in the third quarter K.L.M. actually carried fewer passengers on Atlantic routes than in the third quarter of 1960. Overall traffic rose by 6% in the third quarter but there was a decline in traffic revenues because of a swing to the lowest fare categories.

HELICOPTER AIRLINE. — Airobus Inc., of Rochester, N.Y., has applied to the C.A.B. for certification as a helicopter airline serving Niagara Falls, Buffalo, Batavia, Rochester, Newark, Geneva, Auburn and Syracuse. If approved, Airobus will operate three Sikorsky S-61s.

COMET ACCIDENT.—A de Havilland Comet 4 on the Aerolineas Argentinas service from Buenos Aires to New York crashed shortly after taking off from Vira Copos Airport, near Campinas, Brazil, on Nov. 23. The 40 passengers and 12 crew were killed. Vira Copos, with a single 9,850 ft. runway, is used to serve São Paulo, the nearer Congonhas Airport being too small for Comet operations. The aircraft apparently failed to climb after take-off and cut a long swathe through a clump of trees before coming to rest. The engines were still developing power after the impact.

TWO ACCIDENTS.—Six passengers and the pilot were killed when an Aero Commander of Bay of Plenty Airways crashed on a scheduled flight from Wellington, N.Z. to Rotorua on Nov. 21. Two of the three crew members were killed in a DC-3 of Rhodesian Air Services (Pvt.), Ltd., which crashed on take-off from Salisbury on Nov. 22. It was on charter to the U.N.

News About People

INDIAN RETIREMENT.—Shri K. M. Raha, the Indian Director General of Civil Aviation, has retired after more than 30 years' service in the civil aviation department. A graduate of Cambridge University, he trained in civil aviation in the U.K. between 1928 and 1930. He became deputy D.G.C.A. in 1947 and D.G.C.A. in January, 1958.

CALEDONIAN BOARD.—Membership of the board of Caledonian Airways (Prestwick), Ltd., has now been announced. The six directors are: Mr. John de la Haye (managing); Capt. Adam Thomson (deputy managing); Mr. Frank Hope (commercial); Sq. Ldr. Dennis Standen (financial); Capt. A. H. J. Williams (chief pilot) and Mr. D. H. Walter (technical). The sales manager is Mr. Bernard C. Fisher and the operations manager, Mr. David M. Parlane.

TEDDINGTON DIRECTOR. — Mr. R. Broadbent, a director of the British Thermostat Co., Ltd., parent company of the Teddington group, has been elected to the board of Teddington Aircraft Controls, Ltd.

DOWTY ROTOL SALES.—Mr. C. J. Wegerif, deputy managing director of Dowty Marine, Ltd., and a director of Dowty Rotol, Ltd., has now become sales director of the latter company.

PRESIDENT'S PAINTING.—An oil painting of an Avro 707 research delta was presented to Mr. S. B. Oliver, Hunting Aircraft chief test pilot, at his installation on Nov. 9 as the new president of the London Society of Air Britain. The Avro 707 is described as "Mr. Oliver's all-time favourite aeroplane." It was painted unbeknown to the recipient by Mr. Kenneth MacDonough. Retiring president of the L.S.A.B. is Sqn. Ldr. H. G. Hazelden, chief test pilot of Handley Page.

A.-M.P. APPOINTMENTS. — New appointments announced by Aircraft-Marine Products (Great Britain), Ltd., are those of Mr. E. J. Blythe as chief product engineer and Mr. A. Fowke as head of A.-M.P. laboratories.

DOWTY DIRECTORSHIP. — Mr. K. W. Browning has become a director of D.G. Services, Ltd., a member of the Dowty Group.

IRISH APPOINTMENTS.—Mr. M. J. Whelan has been appointed sales manager of Aer Lingus. He was previously sales development manager in North America. Mr. P. G. Condon has been appointed agency superintendent and Mr. Shaun H. Mayne, district sales manager, Toronto.

SALES APPOINTMENT.—Mr. John F. Martin has been appointed a senior sales representative of Douglas Aircraft Co. He has been with Douglas as a test pilot since 1940, his most recent appointment being assistant director of flight. He will be especially concerned with Douglas sales promotion among local service airlines and business owners.

BIANCOTTO MEMORIAL.—A memorial to the late Leon Biancotto, three times World aerobatic champion, is being erected at the Conflans Ste Honorine (Seine et Oise) cemetery where he is buried. The unveiling will be on Dec. 16 by the French Minister of Public Works and Transport.

DINNER GUESTS.—At the Royal Aero Club's Second Diamond Jubilee Dinner on Nov. 22 were, left to right, Sir Thomas Sopwith, Col. R. L. Preston (Hon. Secretary-General, R.Ae.C.), M. Jacques Allez (President of the F.A.I. and the Aero Club de France) and Lord Brabazon of Tara.

Personal Flying

NEW headquarters for McAlpine Aviation have been built at Luton Airport, and are now being occupied. They comprise a hangar 240 ft. long and 120 ft. wide, offices, crew rooms, workshops and rest rooms. Also included is the first full repair, overhaul and installation service for aircraft radio and navigational aid equipment to be based at Luton.

As well as selling, as sole U.K. agents, Piaggio and Helio executive aircraft, McAlpine Aviation house, maintain and overhaul other companies' machines and the new headquarters were needed to meet the increasing demand on their services. The extensively equipped radio workshop has been set up for installations of new equipment as well as for repair and overhaul of existing aircraft units.

According to Mr. Ray Young, manager of McAlpine Aviation, Luton Airport has expanded greatly in recent months and is assuming even greater importance as the new extended runways and lighting system make it serviceable for international airlines. It is a good centre for flying because of its easy reach of London along the M1 motorway. The new radio section should prove invaluable to executive aircraft operators. It provides particular specialist services for owners and operators of such aircraft as the Piaggio P.166, Helio Courier, Cessna 310, Aero Commander, the Piper series, de Havilland Doves and Herons and Dakotas.

* * *

● Four Tiger Moths of the Royal Navy were flown to the South of France and back during the summer by midshipmen from the Royal Naval College, Dartmouth, who had been trained at the Plymouth Aero Club. In all, 16 midshipmen were involved, and had been trained to P.P.L. standard during the summer term. Since then, two further summer flying clubs have been held at Roborough, from these resulted 26 first solo flights.

● According to Holman and Co. (Engineers), Ltd., of 185 Fordneuk St., Glasgow, S.E., and the U.K. dealers for Umbaugh Aircraft, the Model 18 gyroplane has been certificated by the Federal Aviation Agency, and an infinite life has been claimed for the rotor and control system.

A demonstration aircraft is expected in the near future by Holman and Co., although production schedules of the Umbaugh appear to have been rather delayed.

● Sir Mark Norman, eldest member of a flying family which includes brothers Desmond and Torquil, was one of more than 25 members of the Fair Oaks Aero Club to gain their P.P.L.s during the summer. Flying rates for the club fleet have been increased to £4 15s. an hour for the Tiger Moths; £5 for the Austers; £5 10s. for the Colt; and £7 for the Caribbean, all dual or solo.

● A special instrument rating has been introduced by the Oxford Aeroplane Club as an intermediate stage between the normal P.P.L. and the requirements for a commercial-type rating. A course of flying of around 12 hr. has been arranged for the rating, for which applicants must hold a current P.P.L. and restricted RT licence. Technical examinations are to be held on meteorology, aviation law and instruments, together with a practical flying test. The I/F course includes instruction on VOR, ILS and ADF procedures, together with instruction on full and limited panel flight. A counter to the recent claim for the most flying hours per month has been made by the Oxford Club, which achieved 1,598 hr. in August. During the summer, 45 cadets were flying on scholarships, and 27 had gained their P.P.L.s by September.

Gliding Notes

by Dr. A. E. Slater

CAMBRIDGE UNIVERSITY Gliding Club have had a record year's flying. During the past academic year, which is their unit of measurement, their figures (with the average of the previous 10 years in brackets) were: flying hours, 1,302 (693); average time per flight, 17.2 min. (10.7 min); cross-country miles, 3,027 (1,260); mileage flown in closed circuits, 1,007 (205); Silver "C" legs, 36 (18); Gold "C" legs, 3 (1).

To encourage winter soaring, until Feb. 28 only the basic charge for the first 10 minutes from an aero-towed launch will be made, however long the pilot stays up.

At the club's annual dinner on Nov. 18, held again in Emmanuel College, a guest of honour was Robert L. Neill, chairman of the Midland Club, where the Cambridge Club spend much of their vacations at a level 1,450 ft. higher than that of their home ground. Mr. L. V. Worsdell, chief pilot and manager of Marshall's aerodrome, speaking for the guests, revealed that his association with John Pringle, the club president, began in 1927, eight years before the club was formed.

The trophy presented by Sir David Brunt 13 years ago, for the highest climb by an undergraduate member of a university gliding club each year, has reverted to Cambridge after being won last year by Imperial College for the first time. There are still only two university clubs in the running for the Brunt trophy.

This year's winner is J. B. Brenner with 9,600 ft. in an Olympia. Other Trophy winners were:—

Pot Pewter Pringle, J. Pickett-Heaps for 7 hr. 10 min. duration in thermals; Mug Metal Machin and President's Trophy, G. Siegfrid Neumann for 128-mile triangle and 3,791 points on the president's ladder, respectively; Undergraduate trophy and Paget prize, Abdul R. Ismail with 1,036 points on the ladder; Pons Pot, Lionel Alexander (who presented it) for 218 miles from Lasham to St. Just; Slazenger Trophy, Paul Bethell-Fox for 31.3 m.p.h. round a 70-mile triangle in a Skylark 2; Measure Massive Menkevich, J. Burton for 63-mile goal flight for Silver C. This last flight was to the Oxford Club's site at Weston-on-the-Green, but the annual £5 prize for the best flight between the two places is in abeyance as the fund has dried up.

* * *

ON the main news page of a leading newspaper on Nov. 20 appeared the headline: "Glider Pilot Killed." Any readers who troubled to read on would have discovered that someone unfortunately lost his life while flying a Tiger Moth aeroplane, and that he had, in the course of his life, flown gliders. So, in fact, have hundreds of other aeroplane pilots. Considering the way the average reader skims through his newspaper, it is highly probable that the only words to stick in his memory would be those of the headline.

If in the future (though we hope not) the victim of a motoring fatality should be found to have done some balloon-jumping earlier in his life, that sport could, in turn, be similarly brought into disrepute by some such headline as "Balloon jumper fatally injured."

* * *

AUSTRALIAN gliding clubs together receive a Government subsidy of £3,000 a year, of which half is distributed in proportion to club membership and the other half according to the number and kind of gliding certificates gained.

The total subsidy is more than this, and the Gliding Federation of Australia, which allocates it, proposes to spend £500 in the coming year to help the National Gliding School at Gawler, S.A.; £650 to establish an office with part-time staff; £70 for its officers to travel between States; £490 to help the magazine *Australian Gliding* to produce technical supplements; and—most novel of all—more than £700 to help the manufacturing industry to develop new sailplane designs.

The manufacturing industry means the firm of Edmund Schneider, Ltd. Schneider took a leading part in the design of the famous Grunau Baby in 1931, at his factory near the late Wolf Hirth's gliding school at Grunau in Silesia. He was encouraged by the Australians to emigrate there just after the War in order to start a glider factory in South Australia, but has now returned to Germany and joined Hirth's factory near Stuttgart, leaving his son Harry in charge in Australia.

The subsidy is likely to be used to develop the two-seater Kookaburra training machine in its latest versions, the Mk. 4 and the large-span ES-52B, and also the new Arrow, of which the prototype is expected to fly early next year.

An Australian distance record has been set up by John R. Blackwell, of the Southern Cross Gliding Club, who flew 309½ miles from Narromine in N.S.W. to Wangaratta in Victoria. Mervyn Waghorn, of Sydney, held the previous record of 303 miles.

An historical article in *Australian Gliding* reveals that a copy of Robert Kronfeld's famous Wien sailplane of 1929 was built in Australia, but at what date it is not clear. After the Waikerie Club was formed in 1937, E. R. "Jock" Barratt, a pioneer of Australian gliding, used to fly it enough to claim the subsidy given for gliders "in flying condition," but no more. Later, the wings were shortened and the tail grafted on to a Pratt fuselage, so that it could be used as a two-seater trainer from 1944 onwards.

Correspondence

Plus ca Change . . .

IATA are now taking stock, not without gloom, of the position of the World's airways.

The following extract from *The Times* of 100 years ago, headed "Shipping Subsidies," Oct. 26, 1861, may (or, in view of the "Queen" replacement argument, may not) give them encouragement:—

Steam navigation has not yet fulfilled all the promises that were made in its behalf. True the world has been girded by ocean lines which traverse great distances with wonderful speed and regularity; true America has been placed at nine days' distance, and India at four weeks' distance from us. But what has been a scientific success has been a pecuniary failure. All the great lines are kept up by subventions of enormous amount. The Cunard line, the Peninsular and Oriental and the West India Lines draw from the revenues of the Post-office sums amounting to nearly three-quarters of a million sterling yearly. And this money is, no doubt, actually necessary to keep the steamers at work. It is asserted, and probably with truth, that in the present state of mechanical science it would be impossible for the companies to perform the service required of them merely by means of the regular profits of trade, the passage money of travellers, the postage of the letters, and the freight. In fact, the Persia or the Atrato never could pay its expenses, and if the nation wishes for rapid communication between the two hemispheres it must pay in its corporate capacity, and not trust to the support which private enterprise receives from private wants. Indeed, there is said to be no instance of a first-class steamer, capable of rapid passages, being profitable on long voyages. Ocean steam navigation, therefore, is still a delicate and weakly plant, which is unable to bear the keen air of competition and free trade, and must be fostered yet awhile by the genial warmth of Government support.

In fact, as a wise Frenchman said: "The more things change, the more they remain the same."

Ipswich. H. J. PARHAM.

The Aerial Advertising Ban

I WAS very pleased to see your comments on aerial advertising in "Personal Flying" (Nov. 16 issue). The operators are perhaps not as small as you imagine—I have done 1,000 hours' towing this season with the Lamtex Prentice G-AOKH (all accident-free, as you observe) and Airviews (Manchester) must have flown a similar amount. Perhaps a letter from Mr. Martin would help here.

I look forward to a moderate amount of compensation (pension perhaps?) from the Government, having been made redundant by this ban—but then I always have been a dreamer!

In my search for alternative employment I have considered cutting all ties with general aviation and digging into some secure, cosy niche. A career with the Ministry springs to mind, but that would be too, too nauseating.

Excuse me while I "fade quietly away."

Rawdon, Leeds. J. STUART HOARE.

Post-war Flamingo

I HAVE just come across two letters from Mr. Dennis M. Powell (Nov. 25 last) and Neil Urquhart (Dec. 23) concerning the last of the D.H.95 Flamingoes.

Perhaps solving the whole problem is a note in THE AEROPLANE of May 9, 1947, headed "The Flamingo Flies Again." It reads:—

"On a delivery flight the first D.H. Flamingo, G-AFYH, to fly since the end of the War left Gatwick on May 3 for Redhill. After reconditioning and overhaul by Southern Aircraft, Ltd., the Flamingo was delivered to British Air Transport, Ltd., who will be putting it into service for charter operation from Croydon in a few days."

According to the Register this aircraft, which was actually the 11th D.H.95, named "King William," was withdrawn from use in June, 1954.

Frankfurt. P. GERHARDT.

Supersonic Birth-pangs

TEST FLYING, it seems, has undergone a radical change. As one who takes an interest in first flights I was interested to learn from a news item in your issue for Nov. 16 that on its initial flight the first Fokker-built Super Starfighter went supersonic. You record that "Much of the flight was made at Mach 1.5 after take-off climb to supersonic speed."

Referring back to an earlier issue, that for Aug. 24, you note that the third and fourth Canadair CF-104s (the first to be flight-tested by Canadair) both reached Mach 2 on their maiden flights.

Is one to assume that the standard practice of high-speed test flying nowadays is to take the bull by the horns and on the first flight to stretch the aircraft to almost the limits of its performance—a sort of kill or cure method? One recognizes the fact that the Starfighter now ranks as a proven type. Nevertheless it still appears to be rather a brash procedure. Gone, it would seem, are the days when a new aeroplane was "nursed" into the air and "felt-out" by its pilot.

Ware. P. E. WALKER.

Groundabout

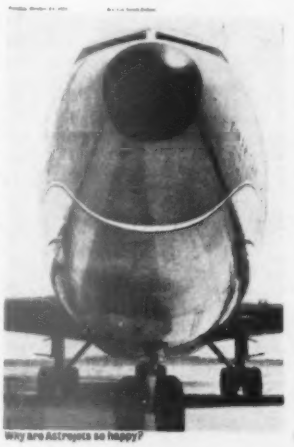
Inverted World. After the publicity din of "First Jetliner," "First Atlantic Jetliner," "First Fastest Jetliner," etc., there comes what almost amounts to a claim by B.O.A.C. to be running the only scheduled propeller-aircraft service across the Atlantic, which allows them to offer the lowest fares on that route. If, as I believe, their Britannia load factor is higher than that of their 707s on that route, a conclusive conclusion might be concluded. The same sort of claim to be at least *different* from the Joneses' is made for America's 2-place, 2-engine Champion Lancer—"Fixed landing gear and props," they say, "are among its unique features."

*

Long-Felt Want. A.R.B.'s house journal "Above Board" usually has the light touch and in the current issue it takes the form of a cunningly ingenious drawing of "The Automated Buck-Passing Machine." Among its features are: WIPER FOR KEEPING DESK CLEAR; HIGH FREQUENCY CHECKING VALVE FOR CHECKING THE CHECKER WHO CHECKS THE CHECKER'S CHECKS; SIMPLE ISSUE COMPLICATOR; HELIOGRATIATOR FOR AUTOMATICALLY BLAMING IT ON THE BLOKE WHO LEFT LAST YEAR; HYDRAULIC JACK FOR LETTING DOWN LIGHTLY and an I'M ALL RIGHT JACK. A.R.B. don't actually *use* these devices, of course, they just come up against them.

*

Personality Cult. Individual airlines dream up their own lures, in which the word "Golden" often looms, but Qantas now bang the drum by naming their new turbo-fan 707s "V-Jets." By some tortuous reasoning, this derives from "vannus" which of *course* you know is Latin for "fan." Then a B.O.A.C. friend in New York has sent me the accompanying American Airlines advt. (it's 2 ft. by 1 ft.) showing the lengths, or depths, that operators are being driven to to improve load factors. I mean, whoever heard of *faces* on *aeroplanes!*



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Is Your Economic Showing? Sikorsky have had a letter from Los Angeles Airways praising the S-62 turbine helicopter they've been operating. They say that its economics are "substantially less" than those of the S-55. I'm sure they don't mean it's less economical but just that its economics are, well, *smaller*, sort of.

by Gyrex

Industry Record

Flight Instrument Calibration

Something new in the way of test equipment for flight instruments is now being offered by Bryans Aeroquipment, Ltd., of Mitcham. This has become possible as a result of associations with the Hass Instrument Corporation of Washington, D.C., for whom Bryans act as European licensees.

It is intended for providing precise setting and automatic controlling of negative, positive and differential pressures when calibrating capsule-operated instruments and/or systems. Obvious applications in aviation which come to mind are to such units as direct-reading and servo-operated altimeters, airspeed indicators, Machmeters and air-data computers.

The equipment as a whole can be divided into two parts—catering respectively for absolute and differential pressures.

The first comprises a barometer, pressure controller and reference vacuum pump. The barometer covers a range from zero to 31 in. Hg. and is fitted with temperature and gravity compensation devices; a sensitive photo-electric scanner is used for the sighting of the mercury column. Pressure-test point settings can be selected in advance by means of a 20-position stop-bar attachment and cable drive on the barometer. Vacuum output from the reference pump is measured by a MacLeod gauge.

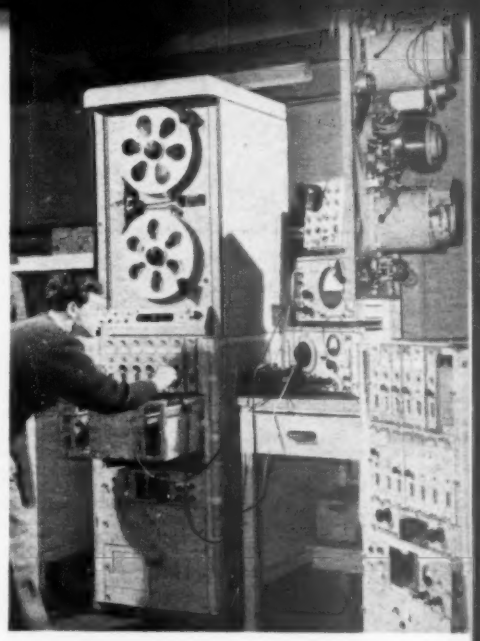
Function of the pressure controller, which also incorporates the amplifier unit of the photo-electric scanner, is to provide a quick and accurate means of supplying and maintaining pressures within between 0.3 in. Hg. and 40 in. Hg. absolute. The reference vacuum pump acts as an absolute pressure reference and in this rôle maintains a vacuum of 1 micron on the head of the mercury.

This section of the equipment, then, provides the necessary altitude information for the calibration of altimeters. When used in parallel with the differential pressure unit referred to below, however, it can provide the altitude conditions necessary for the calibration of Machmeters, etc.

The differential pressure unit is almost identical to the absolute pressure unit except that there is no requirement for a reference pump. Moreover, the barometer range is wider—0-31, 0-62, or 0-105 in. Hg. or equivalent—depending on the upper air speed limitations which are required.

Services needed for operation of the equipment are a pump for the vacuum supply, a pressure supply (either clean dry air or nitrogen) and a distribution panel for the electrical power and pressure supply.

Initial production of the equipment will be partly from American-produced components until Bryans have established their own production line. Cost will vary with the technical requirements of the customer and range between £2,500 and £3,000.



Two of the three Solartron magnetic tape recorders with which Department of Scientific and Industrial Research observing stations will record data telemetered from instrumented satellites. One is to be sited in the Falkland Islands, another in Singapore and the third will be used in association with the Minitrack installation at Winkfield, Berks.

Custom-built Control Systems

Production began on Nov. 23 at the new Hemel Hempstead factory of Honeywell Controls, Ltd. This covers an area of 32,000 sq. ft. and is to be devoted entirely to the manufacture of tailor-made automatic control systems.

The Honeywell automatic systems analyser, which the R.A.F. has specified for use with the Lightning (see THE AEROPLANE AND ASTRONAUTICS for Oct. 26, p. 556), is to be produced here as well as scanning and data-logging units for industrial uses, parts for electronic computers, and equipment connected with the air-conditioning and ventilating side of the company's business. Honeywell also produces microswitches which have found applications in aviation.

The Hemel Hempstead factory is in addition to existing Honeywell premises at Greenford, Middlesex, and Newhouse, Scotland. At the latter, individual controls are produced. One of the tasks of the Hemel Hempstead plant will be to assemble these components into prefabricated tested systems.

Plans are already in being for extending the factory to 120,000 sq. ft. in the next few years.

New Use for Silcoset

A new use for the Silcoset silicone rubbers made by I.C.I.'s Nobel Division has been found by Westland Aircraft who are using them to simplify examination of the internal surfaces of struts and spars. Prior to the use of Silcoset rubbers these members were examined with an internal microscope—a costly operation in terms of time and skill required.

Unlike ordinary silicones Silcoset rubbers can be cured at room temperature and it was this characteristic that made them suitable for this usage, where heat curing was undesirable and where cost of conventional rubber curing equipment was not justified. The rubbers are cured simply by the addition of a catalyst, the curing time being variable to suit the user's needs.

After curing, the flexible casts are withdrawn for close inspection. Impressions have been found to be of such quality that any faults are shown in accurate relief on the surfaces of the casts.

Aviation Calendar

Nov. 30

London.—GAPAN Professional Licence Holders' Meeting and Annual General Meeting, at the Innholders Hall, College Street, E.C.4, at 14.30 hrs. and 18.45 hrs. respectively.

Dec. 1

London.—R.Ae.S. Rotorcraft Section. All-day Symposium, at 4 Hamilton Place, W.1, beginning 09.30 hrs.

Dec. 5

London.—Aviation Forum lecture, "The Royal Aeronautical Society's Place in Aviation," by Dr. A. M. Ballantyne, at the R.Ae.S., 4 Hamilton Place, W.1, at 19.00 hrs.

Dec. 6

Hayes.—R.Ae.S. London Airport Branch lecture, "Aviation Fuels," by W. S. Little, at the Fairey Lecture Hall, at 18.15 hrs.

Dec. 7

Manchester.—British Institution of Radio Engineers, North West Section lecture, "Radar for Civil Aviation Purposes," by K. F. Slater, at Manchester College of Technology, at 19.00 hrs.

Prestwick Airport.—R.Ae.S. Glasgow Branch film show, at Scottish Aviation, Ltd., at 19.30 hrs.

Dec. 12

London.—R.Ae.S. Astronautics and Guided Flight Section lecture, "Military Design Requirements of Guided Missiles," by Brig. E. W. Denison, at 4 Hamilton Place, W.1, at 18.00 hrs.

Luton Airport.—R.Ae.S. Branch lecture, "707 Operation," by Capt. H. L. Fry, in the Napier Senior Staff Canteen, at 18.00 hrs.

Dec. 13

London.—Royal United Service Institution lecture, "Some Reflections on the Strategic Air Offensive, 1939-1945," by Dr. N. Frankland, at the Institution, Whitehall, S.W.1, at 15.00 hrs.

London.—R.Ae.S. Agricultural Aviation Group All-day Symposium, "The Uses of the Aeroplane in Agriculture," at 4 Hamilton Place, W.1, beginning 10.00 hrs.

Manchester.—R.Ae.S. Main Society lecture, "The Airline Approach to Aircraft Selection," by R. Nivet, at Reynolds Hall, College of Science and Technology, at 19.00 hrs.

Company Notices

NEW COMPANIES

Bournemouth Air Taxi, Ltd. (707,645).—Private co. Reg. Nov. 8. Cap. £100 in £1 shrs. To carry on the business of air transport contractors. Directors: Lionel L. Murry, Hotel Bristol, Terrace Road, Bournemouth; Leslie H. W. Murry, 119 Queens Park Avenue, Bournemouth. Sec.: V. Bernard. Sols.: Andrews, Wetherall, McQueen and Co., P. ole. Reg. off.: Hotel Bristol, Terrace Road, Bournemouth.

Dashwood Aviation and Engineering, Ltd. (707,717).—Private co. Reg. Nov. 9. Cap. £100 in £1 shrs. To carry on the business of servicing, repairing, manufacturing and dealing in aircraft. Directors: Wg. Cdr. George S. J. Gibbs, Armadale, Ryde Road, Seaview, I.o.W.; Air Cdre. John A. Hawkings, 7 Arnison Road, East Molesey; Rt. Hon. Earl of Hardwicke; and John D. Clark. Sol's.: Crossman, Block and Keith, 16 Theoba'd's Road, W.C.1.

INCREASE OF CAPITAL

Air Safaris, Ltd. (643,059). Grand Buildings, Trafalgar Square, W.C.2.—Increased on May 8 by £50,000 in 300,000 ord. shrs. of 1s. and 35,000 ord. shrs. of £1 beyond the reg. cap. of £50,000.

New Patents

APPLICATIONS ACCEPTED

886,136.—**S. Smith and Sons (England), Ltd.**—"Visual indicating devices for use in aircraft." April 28, 1960. (Jan. 20, 1960.) (Addition to 853,034.)

886,174.—**General Precision Systems, Ltd.**—"Ground aviation trainers." Nov. 18, 1958. (Nov. 18, 1957.)

886,304.—**Bendix Corporation.**—"Sensitive speed instrument for aircraft." Oct. 2, 1959. (Oct. 16, 1958.)

886,111.—**Power Jets (Research and Development), Ltd.**—"Aircraft." April 13, 1960. (April 29, 1959.)

886,041.—**Cleveland Pneumatic Industries, Inc.**—"Aircraft landing gear." July 7, 1959. (July 7, 1958.)

886,099.—**English Electric Co., Ltd.**—"Aircraft undercarriages." July 28, 1958. (Aug. 8, 1957.)

886,125.—**Fiat S.p.A.**—"Ground appliance for controlled deceleration of aircraft on landing." Aug. 4, 1959. (Aug. 8, 1958, and Jan. 28, 1959.)

886,204.—**Short Brothers and Harland, Ltd.**—"Launching or engine-testing platform for vertical take-off jet-propelled aircraft." Aug. 30, 1960. (June 25, 1959.)

886,330.—**Short Brothers and Harland, Ltd.**—"Jet-deflection means for use with vertical take-off aircraft." May 10, 1960. (June 25, 1959.)

886,163.—**Soc. Bertin et Cie.**—"Rocket-propelled vehicles." Dec. 8, 1958. (Dec. 11, 1957.)

886,198.—**Soc. Nationale d'Etude et de Construction de Moteurs d'Aviation.**—"Jet deflectors." May 26, 1959. (June 5, 1958.)

886,201.—**Rolls-Royce, Ltd.**—"Jet noise silencer for an aircraft." May 25, 1960. (June 1, 1959.)

Printed specifications of the above will be available on Jan. 3, 1962, and the opposition period will expire on April 3, 1962.

Personal Notices

BIRTHS

Barraclough.—On Nov. 11, at Barnstaple, to Margaret (*née* Urquhart), wife of Flt. Lt. R. H. Barraclough—a daughter.

Kelly.—On Nov. 19, at R.A.F. Hospital Wroughton, to Amelia (*née* Murray), wife of Flt. Lt. J. D. C. Kelly—a son.

King.—On Nov. 10, at R.A.F. Hospital Ely, to Margaret (*née* Anderson), wife of Flt. Lt. V. King—a daughter.

Mallett.—On Nov. 13, at R.A.F. Hospital Nocton Hall, to Fiona (*née* Crane), wife of Flt. Lt. A. Mallett—twin daughters.

McKinstry.—On Nov. 12, at R.A.F. Hospital Cosford, to Janette (*née* Robertson), wife of Flt. Lt. P. E. G. McKinstry—a son.

DEATH

Maclennan.—On Nov. 10, Wg. Cdr. J. E. Maclennan, R.A.F. (retd.)

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Situations Vacant—contd.

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APPLICANTS will be required to hold a R.A.F. instructors category, or equivalent civilian qualifications—C.P.L./I.R., and willing to commence duties on January 1, 1962.
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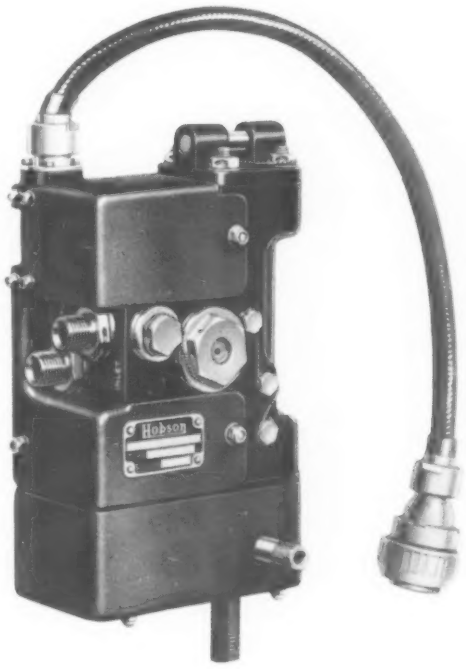

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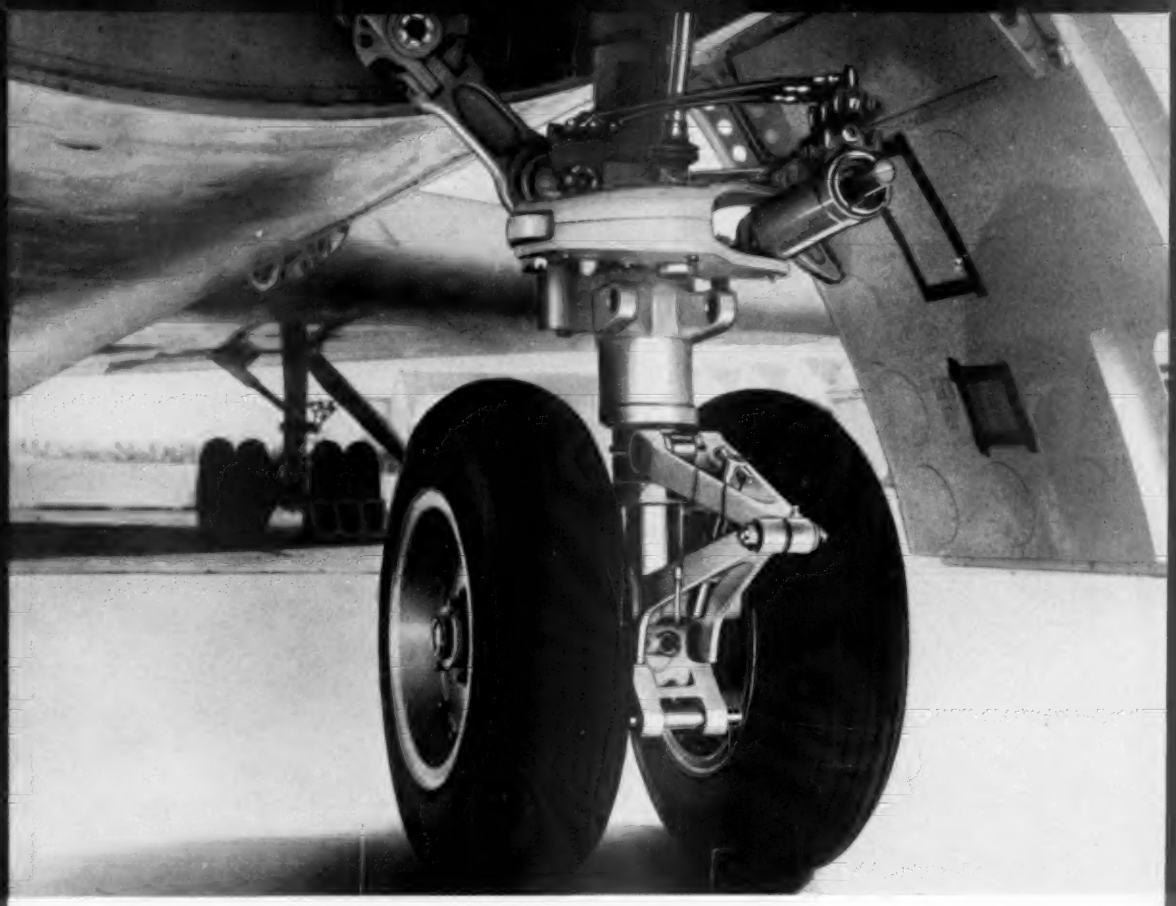

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